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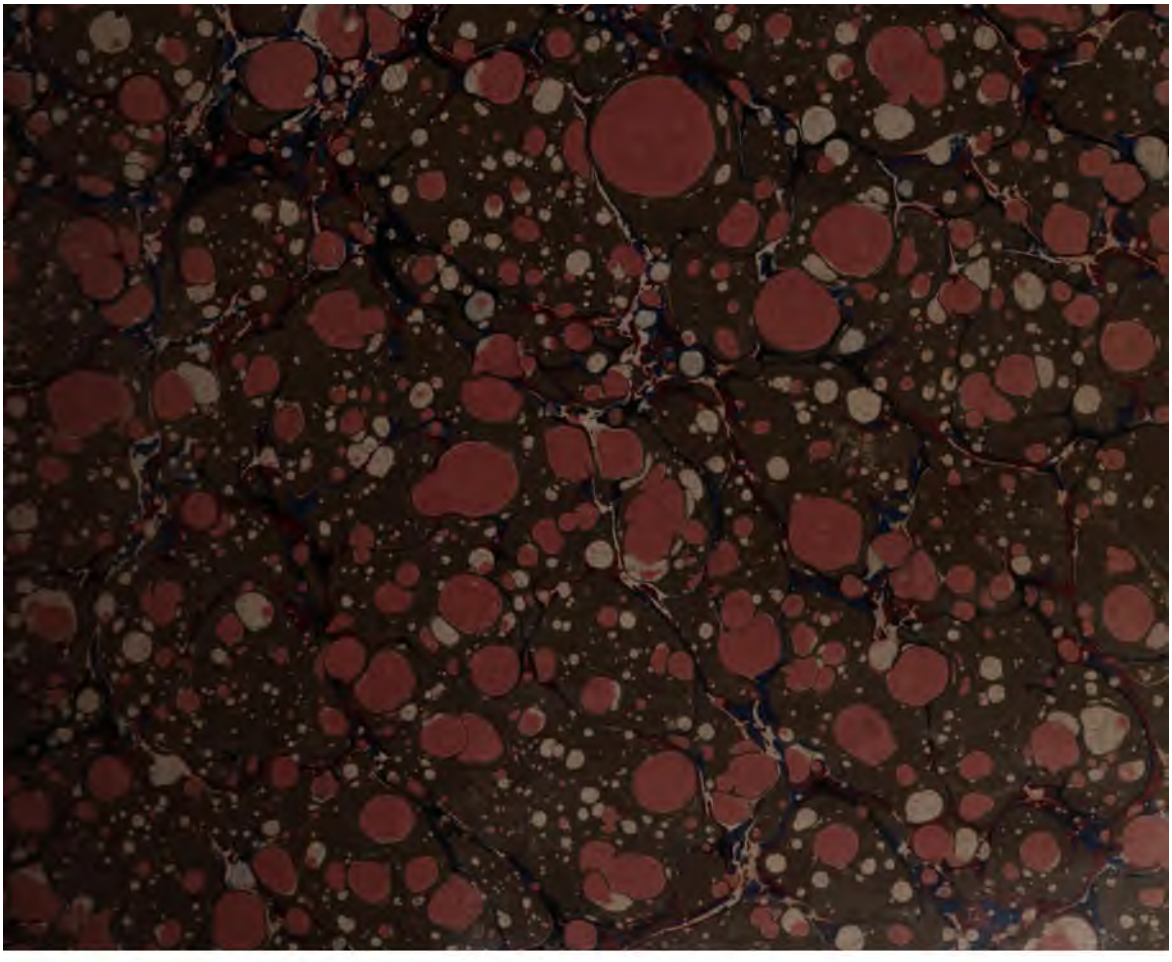

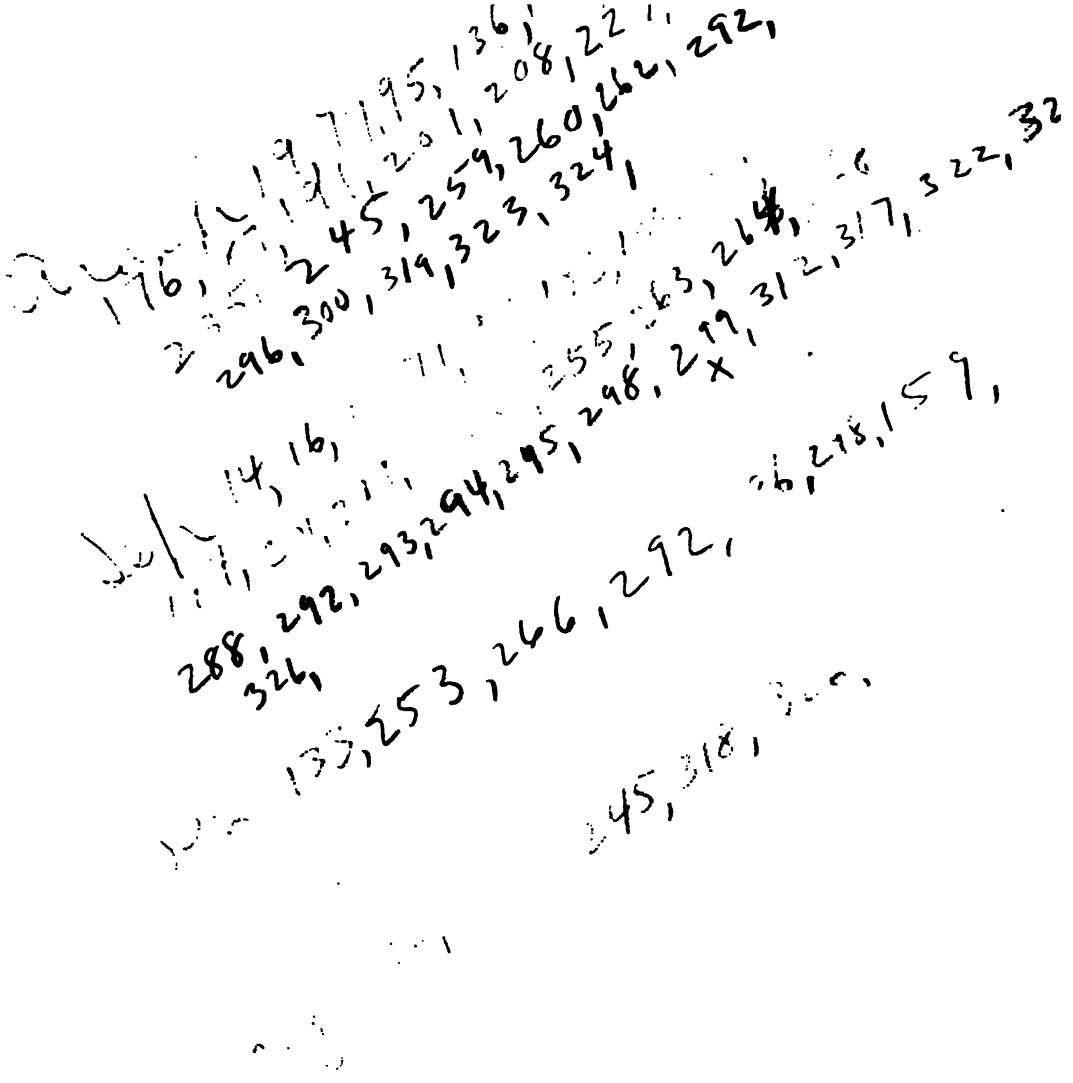

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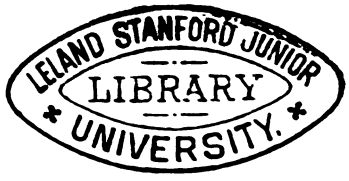

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119	141—152	Mar.	"	3 May	"
120	153—164	Apr.	"	14 June	"
121	165—176	May	"	11 July	"
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136, 227,
208,
245, 259, 260, 266, 292,
296, 300, 319, 323, 324,
14, 16,
288, 292, 293, 294, 295, 298, 299, 312, 317, 322, 324,
326,
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218, 5 9,
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CONTENTS:

ADVERTISEMENTS 2
THE SCALES OF COLEOPTERA. — *George Dimmock* 3–11
INTRODUCTION TO THE FOURTH VOLUME 12–13
PROCEEDINGS OF SOCIETIES. — Cambridge Entomological Club 13–14
BIBLIOGRAPHICAL RECORD, no. 3101–3161 15–18
ENTOMOLOGICAL ITEMS — Society Meetings 19–20

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The Cornell University,
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THE SCALES OF COLEOPTERA.

BY GEORGE DIMMOCK, CAMBRIDGE, MASS.

Altho the following paper is mainly a description of a few forms of scales of coleoptera, on some of which the scales have not before been noticed, and on others of which they have been more or less fully described, a brief outline of the history and bibliography of the knowledge of the scales of insects in general and of coleoptera in particular may not be amiss as an introduction to these descriptions.

According to Mayer[1] and Schneider[2] the scales of lepidoptera were first mentioned, by Fabricius, in 1600, were later mentioned by Malpighi, in 1650, and since then by many other observers. Up to the beginning of the present century the literature of this subject is of little importance except historically, and I will cite only the names of Bonanni, Ledermüller, Réaumur, Rösel and Swammerdamm, who made mention, to a greater or less extent, of the scales of lepidoptera in their works. During the present century the literature of this subject has increased rapidly, and among the authors of leading papers which treat mainly or considerably of the scales of lepidoptera are, in chronological order, Deschamps (1835),[3] Bowerbank (1838),[4] Craig (1839),[5] Ratzeburg (1840),[6] de la Rue (1852),[7] Semper (1857),[8] Kettelhoit (1860),[9]

[1] Mayer, F. J. C. Ueber den Staub der Schmetterlingsflügel. (Allgem. med. Central-Zeit., 1860, jahrg. 29, p. 772-774.) *Hagen, Bibl. entom.*

[2] Schneider, R. Die Schuppen an den verschiedenen Flügel- und Körpertheilen der Lepidopteren. Dissertatio . . . Halis Saxonum, 1878. Also (Zeitschr. f. ges. Naturw., 1878.)

[3] Deschamps, B. Recherches microscopiques sur l'organisation des ailes des lépidoptères. (Ann. sci. nat., 1835, s. 2, v. 3, p. 111-137.)

[4] Bowerbank, J. S. On the structure of the scales on the wings of lepidopterous insects. (Entom. mag., 1838, v. 5, p. 300-304.)

[5] Craig, E. On the configuration of the scale of butterflies' wings, as exhibited in the microscope. (Edinb. philos. mag., 1839, s. 2, v. 15, p. 279-282, fig.)

[6] Ratzeburg, J. T. C. Die Forstinsekten . . . Bd. 2, 1840.

[7] de la Rue, W. On the markings on the scales of *Amathusia horsfieldii*. (Trans. micros. soc. Lond., 1852, v. 3, p. 36-40, pl. 2.)

[8] Semper, C. Beobachtung über die Bildung der Flügel, Schuppen und Haare bei den Lepidopteren. (Zeitschr. f. wiss. Zool., 1857, v. 8, p. 326-339, pl. 13.)

[9] Kettelhoit, T. De squamis lepidopterorum. Dissertatio . . . Bonnae, 1860.

Mayer (1860),[1] Landois (1871),[10] and Schneider (1878).[2] Even special modifications of scales, called by Scudder[11] androconia, have been found on the males of a large number of butterflies, and have given rise to considerable discussion in regard to their function. Androconia were first discovered about 1825 by Baillif, who termed them plumulae. They have been discussed since in papers by numerous writers, among whom may be mentioned Deschamps[8], Schneider,[2] Watson (1865-1869),[12-15] Wonfor (1868-1869),[16] Anthony (1872),[17-18] Fritz Müller (1877),[19] Scudder (1877),[11] Weismann (1878)[20] and Aurivellius (1880).[21] Weismann believes that it is not impossible that these scales give out an etherial oil secreted by the cells at their bases. Without discussing the correctness of Weismann's view, the extensive literature devoted to the scales of lepidoptera, of which I have given only the outline, shows how broad the subject is. But how is it with the scales of insects other than lepidoptera? Are forms as interesting as androconia waiting the search of thoro investigators?

Leeuwenhoek, in 1680, and Swammerdamm,[22] in the next century, figure the scales of the wings and body of *Culex*, and Weismann,[23] in 1864, speaks of scales on *Sarcophaga carnaria*. These are all the references which I know to diptera having scales and I

[10] Landois, H. Beiträge zur Entwicklungsgeschichte der Schmetterlingsflügel in der Raupe und Puppe. (Zeitschr. f. wiss. Zool., 1871, v. 21, p. 305-316, pl. 23.)

[11] Scudder, S. H. Antigeny, or sexual dimorphism in butterflies. (Proc. Amer. acad. arts and sciences, 1877, v. 12, p. 150-158.)

[12] Watson, J. On certain scales of some diurnal lepidoptera. (Mem. Lit. and phil. soc. Manchester, 1865, s. 3, v. 2, p. 63-70.)

[13] Watson, J. On the microscopical examination of plumules . . . (Entom. mo. mag., 1865, v. 2, p. 1-2, fig.)

[14] Watson, J. On the plumules or battledore scales of *lycaenidae*. (Mem. Lit. and phil. soc. Manchester, 1869, s. 3, v. 3, p. 128-133, pl. 1-3.)

[15] Watson, J. Further remarks on the plumules or battledore scales of some of the lepidoptera. (Mem. Lit. and phil. soc. Manchester, 1869, s. 3, v. 3, p. 259-269, pl. 5-7.)

[16] Wonfor, F. W. On certain butterfly scales characteristic of sex. (Quart. journ. micros. sci., 1868, n. s., v. 8, p. 80-83, pl. 1; 1869, v. 9, p. 19-22, p. 426-428.)

[17] Anthony, J. The markings on the battledore scales of some of the lepidoptera. (Mo. micros. journ., 1872, v. 7, p. 1-3, pl. 1-2.)

[18] Anthony, J. Structure of battledore scales. (Mo. micros. journ., 1872, v. 7, p. 250.)

[19] Müller, Fritz. Ueber Haarpinsel, Filzflecke und ähnliche Gebilde auf den Flügeln männlicher Schmetterlinge. (Jena. Zeitschr. f. Naturw., 1877, bd. 11, p. 99-114.)

[20] Weismann, A. Ueber Duftschuppen. (Zool. Anzeiger, 1879, Jahrg. 1, p. 98-99.)

[21] Aurivellius, C. Ueber sekundäre Geschlechtscharaktere nordischer Tagfalter. (Bihang till k. Svenska vet.-akad. handlingar, 1880, bd. 5, n:o 25.)

[22] Swammerdamm, J. Buch der Natur. . . . Leipzig, 1752.

[23] Weismann, A. Die nachembryonale Entwickelung der Musciden. . . . (Zeitschr. f. wiss. Zool., 1864, bd. 14, p. 187-336.)

will add here to their number, that I have found scales upon the legs of a species of *Ploas* from Germany.

Scales have been examined, but not extensively studied, which were obtained from *thysanura* (*Lepisma*, *Machilis* and *Podura*). L. Landois[24] speaks of scales in *Phthirius*, but it is evident from his description that they are not homologically and structurally like the scales of lepidoptera. Leydig,[25] to whose paper I shall have occasion to refer later, mentions scales resembling those of lepidoptera on spiders of the genus *Salticus*. Claus[26] says the *phryganidae* are "with hairy or scaly wings," but I know of no special studies made upon the scales of these insects. As far as I have been able to discover, scales have only been recorded on hemipterous insects in the case of the curious dimorphic form of *Aphis aceris* (originally described by Thornton, in 1852, as *Phyllophorus testudinatus*) which is figured and briefly described by Packard,[27] and have never been recorded from hymenoptera.

I come now to what is more strictly the subject of this paper, the scales of coleoptera, the literature of which I have, as far as possible, seen and studied.

The earliest mention that I have found of scales on coleoptera is in 1762, by Geoffroy,[28] who not only mentioned scales on several *curculionidae*, but also noticed those of *dermestidae* and *scarabaeidae*. The next notice of scales of coleoptera is in 1773, by Drury,[29] in his description of *Entimus imperialis*, where he alludes to the scales upon this species of *curculionidae*. In 1777, Lindenberg[30] figured and briefly described *Entimus imperialis* and the scales which render it so brilliant. In 1780 the same author[31] gave quite an extended description, accompanied by colored figures, of the scales of *Entimus*. Lindenberg's last paper is partly devoted to a curious consideration of the question why insects and small animals, some of them requiring a microscope to reveal their beauty, were made even more beautiful than larger animals. Since the above-mentioned papers were published, many

[24] Landois, L. Untersuchungen über die auf dem Menschen schmarotzenden Pediculinen. Anatomie des *Phthirius inguinalis* Leach. (Zeitschr. f. wiss. Zool., 1864, v. 14, p. 1-41, pl. 1-5.)

[25] Leydig. F. Zum feineren Bau der Arthropoden. (Müller's Archiv, 1855, p. 376-480, pl. 15-18.)

[26] Claus, C. Grundzüge der Zoologie. 4te Aufl. 1880.

[27] Packard. A. S. Guide to the study of insects . . . Salem, 1869, p. 520-521.

[28] Geoffroy, E. L. Histoire abregée des insectes qui se trouvent aux environs de Paris . . . v. 1, 1762. [See especially p. 69, 78-79, 114, 115, 277, 282-283, 288, 289, 293, 293, 295 and 299.]

[29] Drury. Illustrations of natural history . . . v. 1, 1773.

[30] Lindenberg. Beschreibung eines brasilischen Rüsselkäfers. (Der Naturforscher, 10tes Stück, Halle, 1777, p. 86-87, fig.)

[31] Lindenberg. Ausführlichere Beschreibung des . . . brasilischen Rüsselkäfers, nebst einigen Betrachtungen. (Der Naturforscher, 14tes Stück, Halle, 1780, p. 211-220, fig.)

popular descriptions and brief notes upon the scales of coleoptera have been printed, especially in handbooks for microscopists, but the important contributions to the subject are in Dujardin's Manual for the microscope,[32] in Deschamps' Researches on the elytra of coleoptera[33] and lastly in Fischer's somewhat extensive dissertation[34] on the scales of coleoptera, published in 1846. Fischer's dissertation was based upon a large collection of coleoptera of Europe, which he examined and considered by families. He classified the scales of *curculionidae* into four groups and made a fifth group of the kind of scales found on *Anthrenus*. These divisions will be considered later, in connection with the form and structure of the scales.

I will begin the descriptive part of my paper with an explanation of the hairs of *Cicindela dorsalis*, for I wish to say a good deal about scale-like hairs in this paper, since the scales of coleoptera are simply flattened hairs of a more or less complex nature. In the progress of this paper I hope to be able to point out affinities, not previously noted, between hairs and scales of coleoptera.

[32] Dujardin, F. Nouveau manuel complet de l'observateur au microscope. Avec atlas. Paris, 1843.

[33] Deschamps, B. Recherches microscopiques sur l'organisation des élytres des coléoptères. (Ann. sci. nat., 1845, s. 3, v. 3, p. 354-363.)

[34] Fischer, L. H. Microscopische Untersuchungen über die Käferschuppen. Dissertation . . . Freiburg, 1846, fig. Reprint (Isis, 1846, v. 6, p. 401-421, fig.)

HAIRS OF CICINDELA DORSALIS.

The white hairs which clothe the sides of the thorax of *C. dorsalis* and are abundant upon nearly all parts of the under side of this insect, even upon its legs and upon some of its mouth-parts, owe their white color to the presence of air in their interior.

In transverse section these hairs — for they are scarcely flat enough to be termed scales — are circular, ellipsoidal (as in fig. 1, *d*) or with a slight tendency to be triangular. The central

Fig. 1. Hairs of *Cicindela dorsalis: a*, from thorax; *b*, same partly deprived of air; *c*, apical end of same; *d*, transverse section of same; *e*, basal end of same; *g*, hair from antenna. Enlargement: *a*, *b* and *g*, 100 diam.; *c*, *d* and *e*, 300 diam.

portion is a canal, about one-fourth the diameter of the whole hair, and is filled with air. This canal is surrounded by very minute cavities forming a sort of pith-like substance filled with air and extending outward to the outer chitinous covering of the hair. The cavi-

ties or interstices of the pith-like portion open into the central canal of the hair, but are prevented from direct communication with the outer air by the thin sheath of chitin which forms the outer covering of each hair. Each hair is closed at the apex (fig. 1, *c*) by this outer, impervious chitin layer and at its basal end (fig. 1, *e*) by a thickening of the chitin sheath to such an extent as to entirely close the central canal, with its surrounding pith-like substance, from the outer air. This structure, together with the mode of closing of the basal end, leaves the nature of the development of the hair very apparent. It is a closed sacciform appendage of the external chitinous covering of the insect, as are the scales of lepidoptera, coleoptera and diptera. The knob formed by the basal end (fig. 1, *e*) of the hair is inserted into a pit in the chitin covering of the insect, almost exactly as the corresponding part of the scales of other insects are attached.

The structural points above described were obtained in two ways; first, by sectioning the hairs with the microtome, and, second, by carefully observing under the microscope the action of different reagents on the hairs. I obtained a few good transverse sections of hairs taken from the sides of the thorax, and, by examination of these sections, verified the existence of an open central canal. Fig. 1, *d*, shows one of these sections which was about 0.01 mm. in thickness and about 0.02 mm. in average diameter, drawn with the camera. The expulsion of the air from these hairs, when they were broken at any point, was readily effected by chloroform or alcohol, and scarcely less readily by glycerin, by turpentin, or even by water, but if the hair had not been injured at any point the air was not driven out by any of these reagents, even after several days action. When the air has been expelled from a hair, the latter becomes transparent, and is colorless with directly transmitted light in all parts except where the chitin is thickened to close the base; this chitin is slightly brown. By obliquely transmitted light, obtained by Aubé's illuminating apparatus, the hairs which have been deprived of air exhibit a slightly bluish shade. Fig. 1, *b*, represents a hair of which the distal end has been deprived of air, the part from *x* to *y* is partly deprived of air and the basal portion is still filled with air. Sometimes, especially when glycerin or turpentin is used to expel the air, a part of the air will remain collected in the central canal (fig. 1, *x* to *y*) quite a while after it has left the cavities of the pith-like portion. The clearly defined outline of this column of air led to the suspicion of an open canal, the presence of which was later proved by sections.

The hairs from different parts of *C. dorsalis* vary little in form and size. Those from the thorax and from the under side of the abdomen are club-shaped (fig. 1, *a* and *b*), are from 0.28 to 0.35 mm. in length, and from 0.015 to 0.025 mm. in diameter. They taper gradually and slightly from the middle toward

both ends; the apex is usually truncated (fig. 1, *c*). The basal part forms a slight neck just above the point of insertion (fig. 1, *e*). These hairs are but slightly curved, but are so inserted as to lie nearly flat on the surface of the insect. The hairs (fig. 1, *g*) from the antennae are the smallest of the white hairs on *C. dorsalis*. They are only about 0.07 mm. long and scarcely 0.01 mm. in diameter near the base, from which they taper to their acute tip. The longest hairs are those from the labial palpi, of which the second joint only is densely hairy. These hairs are from 0.30 to 0.50 mm. long, and about 0.015 mm. in diameter near their base, from which they taper gradually to a fine, acute apex. They are considerably curved and slenderly filiform.

Between and upon the hairs of this beetle are yellow, amorphous masses, quite transparent, and apparently secreted from the surface of the insect, altho they may be remnants of some matrix in which the hairs are packed during the pupal state of the insect. Fischer mentions substances of apparently similar nature in his dissertation,[34] and Hagen,[35] in 1882, further discusses them. These masses on *C. dorsalis* often take beautifully clear impressions of the hairs themselves, and are insoluble in water, alcohol, turpentin, glycerin or chloroform.

With the exception of the elytra, labrum and parts of the mandibles, all white portions of *C. dorsalis* owe their creamy whiteness to the hairs described above; these hairs are set on shining, cupreous or green-bronze surfaces.

The hairs upon the sides of the thorax of *C. vulgaris* and *C. puritana* are similar in structure and general form to hairs from the same region in *C. dorsalis*, but they are smaller in *C. puritana* (0.18 mm. long by 0.01 mm. in diameter) and slimmer in *C. vulgaris* (0.55 mm. long and about 0.01 mm. in diameter); in the latter species they are not so abundant.

Taking the families of coleoptera in their systematic order, I examined next the scales of

ANTHRENUS SCROPHULARIAE.

The figuration of the whole body and even of the legs of this insect is due to scales which are not imbricated as are

Fig. 2. Scales of *Anthrenus: a*, of *A. scrophulariae; b*, arrangement of same on portion of an elytron; *c*, scales of *A. varius*. Enlargement: *a* and *c*, 100 diam., *b*, 50 diam.

the scales of lepidoptera. The basal end of each scale is inserted in a cavity which is at the bottom of a funnel-shaped deepening of the chitinous surface of the insect, and the scales are arranged to a certain extent, altho rather irregularly, in lines. Fig. 2, *b* shows

[35] Hagen, H. A. On the color and the pattern of insects. (Proc. Amer. acad. arts and sciences, 1882, v. 17, p. 234-267.)

their order on a portion of an elytron, the little circle about the base of each scale showing the limits of the funnel-shaped depression in which each scale is inserted. These scales are about 0.05 mm. long by 0.03 mm. wide. They are of three different colors — white, light brown and black—and they all contain air. These scales were described by Fischer and I introduce and figure them here (fig. 2, *a*) only because they furnish a good example of what Fischer termed fibrous scales (Faserschuppen).

Of other species of *dermestidae* I only examined *Dermestes lardarius* and *Anthrenus varius*, for I have had access to but a portion of my collection, which I hope to examine more thoroughly later. The former species was clothed with hairs only.

SCALES OF ANTHRENUS VARIUS.

The figuration of *A. varius* is due, like that of *A. scrophulariae*, to scales which do not inbricate. The scales of *A. varius* (fig. 2, *c*) are narrower than those of *A. scrophulariae*, being about 0.05 mm. long by 0.015 mm. wide. In color they are either dark brown, yellow or white; and they are striate, but the striae, about six in number, are rather obscured by the presence of much air in the scales until the latter are treated with liquid reagents. The fine notching at the apical end of scales of *A. varius* is not so evident as it is in those of *A. scrophulariae*, as can be seen by comparing fig. 2, *a* with fig. 2, *c*, both of which figures are equally enlarged.

At this point may be noted the presence of two sorts of hairs on the larvae of certain *dermestidae*, as described by De Geer,[86] Dujardin[82] andThevenet, [87-88] and the existence of scales on the larvae of *Attagenus pellio*, as described and figured by Dujardin,[82] the latter species being, so far as I can discover, the only coleopteron from the larva of which scales are known.

The *scarabaeidae* contain a number of genera in which scales are the rule rather than the exception, and, among them, for the first time, comes the consideration of brilliantly colored scales, those of the genus *Hoplia*.

SCALES OF HOPLIA COERULEA.

This well-known European insect is light metallic blue above and silvery beneath, but when deprived of the scales to which its metallic coloration is due, it is brown. The scales of the elytra and upper surface of the thorax are imbricated; those of the abdomen, legs and under side are not imbricated.

The scales of *H. coerulea* vary in form from round to ovate and lanceolate, most

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[86] De Geer, C. Mémoires pour servir à l'histoire des insectes . . . v. 4, 1774, p.——— pl. 8, fig. 4-6.

[87] Thevenet, J. Note sur les poils de la larve de *l'anthrenus verbasci*. (Ann. Soc. entom. Fr., 1874, s. 5, v. 4; Bull, p. 84, 97.)

[88] Thevenet, J. Note sur les poils de la larve du *megatoma serra*. (Ann. Soc. entom. Fr., 1874, s. 5, v. 4; Bull., p. 112.)

of those from the upper side being usually nearly round and smooth (fig. 3, *a*), while those of the under side are more variable in shape and are always

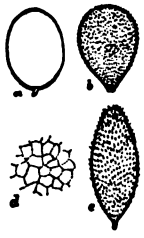

Fig. 3. Scales of *Hoplia coerulea: a*, from elytron; *b*, from under side of thorax; *c*, from femur; *d*, fine structure to be seen in *a* with high powers. Enlargement: *a*, *b* and *c*, 100 diam.; *d*, 500 diam.

covered with spines or hairs (fig. 3, *b* and *c*). The scales upon the legs are most variable of all in form; common among them are lanceolate forms (fig. 3, *c*), covered with fine hairs. The average size of the scales is about 0.10 mm. long by 0.05 mm. wide, and they are attached to the insect by a more or less prolonged basal portion (fig. 3, *a-c*); they lie very flatly pressed upon the surface of the insect.

Most of the scales of the dorsal surface of the thorax and of the elytra, when viewed by transmitted light, are bright canary yellow, but many of them are tinged with carmine red. Viewed by reflected light, or upon a dark background, the parts before yellow are bluish, or dark and nearly invisible, while all the parts before reddish are now dark and more or less indistinct (or rarely greenish if they were purplish-red before). If the stage of the microscope is now revolved, and the light to be reflected from the scales is thus brought from a different direction in regard to the scales, some of the parts before dark become bright bluish while others just before blue become darkened, but in no case do parts of a scale which were reddish by transmitted light become bluish by reflected light. If the light is not excluded from above the stage of the microscope, when examining these scales by transmitted light, places will be discovered, where the scales are injured or where they are turned up at their margins, in which bright blue, or rarely green, will be seen. In all cases where I speak of transmitted light I have excluded the light from above the stage of the microscope, and where I speak of reflected light I have excluded light from below the stage of the microscope.

If the scales are in any way injured or cracked, as they usually are in removing them from the insect, water will readily enter them and discharge the air from them. Scales thus treated with water are, by transmitted light, sky blue, sometimes tinged with carmine red, the latter color being in portions of the scales which had not been thoroughly penetrated by the water, for while the water is entering the scales they become reddish for a time before changing to blue. Boiling the water a minute causes all red to disappear but seems to have no further action on the scales; their structure is not altered, as the water inside such minute cavities is not readily boiled. By reflected light many scales that have been treated with water are dark greenish.

Glycerin produces nearly the same effects in these scales as water does; its action is, however, slower and gives more opportunity to examine the scales during the process of saturation. Light transmitted through scales that are treated with glycerin is nearly colorless, and reflected light from scales thoroughly penetrated with glycerin is, for the most part, colorless; sometimes, however, it is greenish in spots, and these spots are usually where a tinge of red remains, when viewed by transmitted light.

In absolute alcohol the scales show, by transmitted light, a more reddish tinge than they show in water; in chloroform the tinge is more purplish than in water, altho the purple is very pale; in turpentin and in oil of cloves the scales are transparent and colorless. Scales moistened with any of these reagents and put over a dark or black surface are light metallic green; if dry scales are put over dark surfaces they are light metallic blue. Redried from water, alcohol or chloroform these scales regain their original colors, showing that it is a coloration due to the structure of the scales and not due to any pigment in them. In further proof of this I exposed the scales to dry chlorin gas and the color remained unaltered. Solutions of chlorin or of hypochlorites fail to destroy the coloration, for after they are washed out and the scales again dried the colors reappear as bright as at first.

Dry scales heated slightly over flame suddenly lose all their metallic coloration, and, while retaining their form, become brownish grey by transmitted or reflected light; they are apparently charred sufficiently to lose their color without having their structure greatly altered.

In structure these scales are readily seen to be little flattened sacs; wherever they are injured, especially if they are broken off near the base, the edges of the upper and lower sides appear distinctly. The inner structure of these scales is not easily discoverable. They appear to be filled with a very delicate network (fig. 3, *d*), which is always reddish after the yellow has left the scales. If glycerin is used as a reagent in treating the scales their reddish network, even in scales originally yellow, remains long after the yellow has disappeared. The yellow occupies the interspaces of the network. The network itself, under high powers, appears as if it were caused by retiform designs in reddish oil between the layers of the scales, but the fact of the reappearance of the color after treating the scales with solvents for oil, *e. g.*, chloroform, shows that it is not oil. From the appearance of scales charred to different extents I am inclined to think this network to be formed by thickenings of the chitin walls of the scales themselves. If this be the case, the thickenings project only inward from these walls, and are found in corresponding figures upon both upper and under walls of the scales. The colors red and yellow by transmitted light may exist where only the upper or under half of the scale is present.

(*To be continued.*)

PSYCHE.

CAMBRIDGE, MASS., JAN.-FEB. 1883.

Communications, exchanges and editors' copies should be addressed to EDITORS OF PSYCHE, *Cambridge, Mass. Communications for publication in* PSYCHE *must be properly authenticated, and no anonymous articles will be published.*

Editors and contributors are only responsible for the statements made in their own communications.

Works on subjects not related to entomology will not be reviewed in PSYCHE.

For rates of subscription and of advertising, see advertising columns.

INTRODUCTION TO THE FOURTH VOLUME.

PSYCHE enters upon its fourth volume under auspices in many regards more favorable than those which have attended the inauguration of earlier volumes. The material support upon which the CAMBRIDGE ENTOMOLOGICAL CLUB, as publisher, can count, while not sufficient to defray the expenses of publication, bids fair to leave the friends of PSYCHE with smaller deficits to meet than heretofore. The explanation should be made that the CLUB, while devoting all its available means to the publication of PSYCHE, is obliged to rely upon private benefactors to make up its arrears of funds from time to time; else it would be obliged to suspend the execution of its work. The Managing Editor, having faith in the good-will of his fellow-entomologists, and of patrons of science, assumes the responsibility of expenditures which exceed the resources of the Club. Contributions to the Permanent Publication Fund of PSYCHE are earnestly solicited.

In editorial support the management feels especially rich, referring with pride to the published list of associate editors. Without this support the task of issuing a fourth volume of PSYCHE would not have been accepted by the undersigned, who appreciate the difficulties of performing their part well under the pressure of their other occupations, and with the limited resources at the command of the CLUB.

PSYCHE will be devoted, as heretofore, to the presentation of entomology in its higher and more philosophical aspects. It will leave to other magazines the bare descriptions of new species, and contests over priority and synonymy, as well as competition for the earliest announcement of news. As the official publication of the CAMBRIDGE ENTOMOLOGICAL CLUB, it will contain the minutes of the meetings of the CLUB, and serve as a medium of communication between the members. Although the CAMBRIDGE ENTOMOLOGICAL CLUB is a society bearing a local name, its members are chosen without local limitation, and PSYCHE will endeavor to represent the interests of scientific entomology wherever pursued, and to advance, impartially, the welfare of all societies having the same objects in view. Welcoming to its columns original articles of a character suited to its aims, it will seek to present to its readers such notices of, or extracts from, articles of like character, appearing in other publications, as will make it most valuable to the philosophic entomologist. Brief items, and condensed abstracts of the proceedings of scientific societies in all parts of the world, so far as they are related to general entomology, would be thankfully received by the editors. Official notices of the times and places of meetings of entomological societies will be inserted in our column devoted to that purpose, free of charge.

The form of the BIBLIOGRAPHICAL RECORD, being in accordance with the highest thought upon the subject in the world,* will remain unchanged; but the matter will be made more valuable than heretofore, by the exercise of a selection from among the works to be noticed by preference. While it has long been evident that the space which could be devoted to the Record in PSYCHE was insufficient for the publication of complete lists of

*See PSYCHE, March 1880, v. 3, p. 44.

even those writings which it would be most appropriate to notice, the Editor of the Record has not withheld from publication such articles as came to hand, even though of minor importance. He will in the future preserve these in manuscript, indexed as well as may be, for reference, and publish the record only of the more important articles. Should means, from sources yet unknown, be afforded for the presentation of a complete work, none would appreciate the value of it more than he. In order to perfect this record, the editor respectfully requests that copies of publications containing entomological articles may be sent by the authors or the publishers, or by friends of PSYCHE, to the Library of the CAMBRIDGE ENTOMOLOGICAL CLUB, where they will be at the disposition of the subscribers to PSYCHE, throughout North America, under the rules of the CLUB.

B: PICKMAN MANN.
GEORGE DIMMOCK.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

12 JAN. 1883.—The 89th meeting of the Club, the sixth annual meeting since the incorporation of the Club, was held at 16 Quincy St., Cambridge, 12 Jan. 1883. Nine persons (eight of whom were members) were present.

The Secretary stated that Miss Cora H. Clarke had been transferred, 10 Jan. 1883, at her own request, from the list of associate members to the list of active members.

The following persons were elected to active membership: H: Savage, of Boston, Mass.; Prof. Stephen Alfred Forbes, of Normal, Ill.; W: Hague Harrington, of Ottawa, Canada; Prof. G: Macloskie, of Princeton, N. J.; Prof. Francis Huntington Snow, of Lawrence, Kansas.

The annual reports of the Secretary, of the Treasurer and of the Librarian were read and approved, the approval of the Treasurer's report being subject to the action of the Auditing Committee.

A motion was carried "that the Club resume the publication of PSYCHE, beginning with no. 105, of vol. 4 (the no. for Jan. 1883), and that, with the exceptions hereinafter stated, vol. 4 be published in similar style, typographically and otherwise, as vol. 3.

"Exception 1. That the price of subscription be raised to two dollars per year, five dollars per volume of three years, and that subscribers can have, after payment of their subscriptions, if they so desire, in addition to their regular copy, a copy printed on one side of the paper, for pasting the slips of the Bibliographical Record.

"Exception 2. That the editors to be elected be recommended to make the Bibliographical Record more current, if possible, and to omit publishing the record of notes and items of minor value which are contained in the popular and daily press."

Other changes proposed in PSYCHE were, after some discussion, left to the discretion of the editors.

The following officers were elected for the ensuing year: President, B: P. Mann; Secretary, G: Dimmock; Treasurer, S: Henshaw; Librarian, C. C. Eaton; members at large of the Executive Committee, R. Hayward and E: L. Mark.

A motion was carried to elect a managing and an associate editor of PSYCHE, these editors to have full power to add to their number. B: P. Mann was elected managing editor, and G: Dimmock associate editor, for the ensuing year.

The retiring President, Mr. S: H. Scudder, delivered his address, entitled "On mesozoic cockroaches." The address was a general review of what is known of cockroaches of this age and a comparison of their forms with other fossil and living forms. The address was illustrated with many figures and with numerous specimens of fossils.

Mr. W: Trelease communicated (by the Secretary) the following note:

"At the November meeting of the Club, in 1881, I showed a specimen of ant architecture which was further described in PSYCHE for Feb. 1882. At the time this was written I had forgotten that Mr. Walsh has recorded

(Pract. entom., v. 2, p. 40) cases constructed by *Myrmica lineolata*? Say over an aphis on *Cornus stolonifera*, and by a *Formica* over an aphis on *Salix*. A case of the same kind on a species of alder is recorded by Mr. Wm. Couper as occurring near Toronto, in Canada. Lubbock (Scientific lectures, p. 71) states that 'sometimes the ants even build covered ways up to and over the aphides, which, moreover, they protect from the attacks of other insects.'"

Mr. J: G. Jack stated that he had seen *Vanessa antiopa*, with unrolled proboscis, apparently sucking the sweet excretion about aphides, and had noticed similar actions in *Limenitis dissipus* and *L. arthemis*.

Mr. A. F. Foerste communicated (by Mr. W: Trelease and the Secretary) a note concerning the habits of *Alaus oculatus*. This note chiefly described the habit of feigning death and the reluctancy to spring in this species of *elateridae*. Mr. G: Dimmock said he had noticed that *A. oculatus* disliked to spring.

Mr. S: H. Scudder spoke of some specimens of lepidoptera, in different stages, which were for sale by Dr. W: Wittfeld, of Georgiana, Brevard Co., Fla.

Mr. S: H. Scudder said, in reply to a question, that all *hesperidae* spin light cocoons, and that a few other butterflies allied to the *hesperidae* spin delicate cocoons. From these cocoon-spinning forms there is a gradual transition through forms which hang their pupae with a loop to forms which suspend their pupae by the tip of the abdomen only.

9 FEB. 1883.—The 90th meeting was held at 19 Brattle Square, Cambridge, 9 Feb. 1883. In the absence of the President Mr. S: H. Scudder was chosen chairman. Six persons (five of whom were members) were present.

The Secretary read a letter from Mr. S: Henshaw, who regretted that he was not able to accept the office of Treasurer to which he had been elected at the last meeting. [Mr. B: P. Mann will remain acting Treasurer, therefore, until a new election is held.]

A proposition to hold a special meeting of the Club at Minneapolis, Minn., on the day preceding the meeting of the American Association for the Advancement of Science, with other propositions in relation to the proposed meeting, was referred to the Executive Committee with full power to act, but with the recommendation that the Committee should correspond with Mr. J. A. Lintner, who has already been asked to call a meeting of entomologists at that time and place, so that there might be no interference with the meeting to be called by him.

Mr. Mann communicated (through the Secretary) some notes in regard to the arrangements necessary to be made for the issue of volume 4 of PSYCHE, and further remarks were made by the Secretary upon the same subject.

The following persons were elected to active membership: August F. Foerste, of Dayton, Ohio; C: Diehl Zimmerman, of Buffalo, N. Y.; Capt. T. J. Mathews, of Grayville, Ill.; Theodor Pergande, of Washington, D. C.

Mr. G: Dimmock called attention to a paper by Dr. Hermann Henking, entitled, "Beiträge zur Anatomie, Entwicklungsgeschichte and Biologie von *Trombidium fuliginosum* Herm." (Zeitschrift f. wissensch. Zool., 1882, v. 37, p. 553-663, pl. 34-36), outlining briefly the scope of the paper, and especially noticing a method of coloration by an alcoholic borax-carmine solution, as described by Dr. Henking.

Mr. S: H. Scudder exhibited some plates from a paper on fossil neuroptera now in preparation, and a colored plate to illustrate the life-history of a species of *Retinia*, the pine-moth of Nantucket.

Mr. Roland Thaxter called attention to a species of *Nonagria* which he had studied. The larva bores in rushes from which it probably emerges as pupa. The question of how the egg survives the winter in the flooded and frozen marshes brought out some discussion.

Mr. S: H. Scudder exhibited a large number of figures of fossil coleoptera from Florissant, Col.

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name. as: A: Augustus; B: Benjamin: C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac: J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard: S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Adolph. E. Vorläufige mittheilung über die flügel der dipteren. (Zool. anzeiger, 13 Nov. 1882, jahrg, 5, p. 609-610.)

Nature of the wings of diptera. *G: D.* (3101)

Agricultural ant of Texas (The). (Journ. applied sci., Oct. 1881. v. 12, p. 155, 21 cm.)

Notes on the habits of *pogonomyrmex barbatus*. *G: D.* (3102)

Anderson, Joseph, *jr*. On the emergence of butterflies. (Entomologist, Nov. 1882, v. 15. p. 260-261.)

How different butterflies behave just after leaving the pupal skin. *G: D.* (3103)

Anderson, Joseph, *jr*. Singular habit of *apatura iris*. (Entomologist, Aug. 1882, v. 15. p. 188.)

A. iris, after emerging from pupa, hangs to the pupal case with head uppermost for five or six hours, then with head downward a similar time. *G: D.* (3104)

Ashmead, W: Harris. Another chalcid friend of the orange grower. (Florida agriculturist, 13 July 1881, no. 165, v. 4, no. 9, p. 65, col. 4-5, 28 cm.)

Describes *coccophagus flavoscutellum* n. sp. parasitic on *lecanium hesperidum*. *B: P. M.* (3105)

Ashmead, W: Harris. On the cynipidous galls of Florida. Paper no. 1. (Monthly proc. entom. sect. acad. nat. sci. Philad., May 1881, p. 9-14.)

Describes *cynips q. virens, c. q. batatoides, c. q. succinipes, c. q. foliata, c. q. lanigera* = 5 n. sp., from *quercus virens;* note on *c. q. ficus*. *B: P. M.* (3106)

Ashmead, W: Harris. On the cynipidous galls of Florida. Paper no. 2. (Monthly proc. entom. sect. acad. nat. sci. Philad., June 1881, p. 15-20.)

Describes *cynips q. catesbaei* from *quercus catesbaei; c. q. turnerii* and *c. q. aquaticae* from *q. aquatica; spathegaster q. laurifoliae, c. q. confusa* and *c. q. rugosa* from *q. laurifolia; c. q. cinerea* from *q. cinerea* = 7 n. sp.; and *sejus cynipidis* n. sp., parasitic on *spathegaster q. laurifoliae*. *B: P. M.* (3107)

Ashmead, W: Harris. On a gigantic chalcid fly inhabiting Florida. (Can. entom., May, 1881, v. 13. p. 89-90.)

Describes *smicra gigantea*, new species. *G: D.* (3108)

Ashmead, W: Harris. Injurious and beneficial insects found on the orange trees of Florida. (Can. entom., Aug. 1879, v. 11, p. 159-160.)

Describes *acarus? gloverii, aphelinus aspidioticola, lecanium phyllococcus* and *typhlodromus oiliioorus* [sic] = 4 new species. *G: D.* (3109)

Ashmead, W: Harris. On a mite preying on the orange scale insect. (Can. entom., May 1879, v. 11, p. 93-94.)

Describes *oribates! aspidioti* new species, which preys upon *aspidiotus gloverii*. *G: D.* (3110)

Ashmead, W: Harris. On a new species of *aphis* affecting the pine. (Can. entom., April 1881, v. 13, p. 67-68.)

Describes *lachnus australi*, new species from *pinus australis*, in Florida. *G: D.* (3111)

[**Ashmead**, W: Harris.] The orange pyralid moth. *Anaeglis demisalis* Lederer. (Florida agriculturist, 6 July 1881. v. 4, p. 60, col. 2-4, 62 cm.)

Describes habitation, habits, imago and larva of *anaeglis demisalis*. *B: P. M.* (3112)

Ashmead, W: Harris. The plum aphis in Florida. (Pacific rural press, 2 July 1881, v. 22, p. 8, col. 4, 30 cm.)

Describes *aphis prunicoleus* [sic] n. sp., and mentions other *aphidae* found on *prunus* in Florida; list of insect enemies of *aphidae* observed; means against *aphidae*. *B: P. M.* (3113)

Ashmead, W: Harris. On some new species of *chalcididae* from Florida. (Can. entom., June 1881, v. 13, p. 134-136.)

Describes *eurytoma vagabunda*, *decatoma flava*, *d. querci*, *d. lanae*, *d. phellos*, *d. foliatae*, and *d. batatoides* = 7 new species. *G: D.* (3114)

Ashmead, W: Harris. On two new chalcid flies from Florida parasitic upon the larvae of syrphus flies. (Can. entom., Aug. 1881, v. 13, p. 170-172.)

Describes *spalangia? syrphi* and *pteromalus quadrimaculatae*, 2 new species of *chalcidae* parasitic on the larvae of *syrphidae*. *A. K. D.* (3115)

Ashmead, W: Harris. Two new orange insects. (Florida dispatch, 7 July 1881, v. 6, no. 4, p. [1], col. 3, 27 cm.)

[From the *Florida agriculturist*.] Describes *spalangia syrphi* and *s. quadrimaculatae* = 2 n. sp. parasitic respectively on *syrphus pensylvanicus* and *syrphus quadrimaculata*. [In manuscript correction by author, the name of *spalangia quadrimaculatae* is changed to *pteromalus quadrimaculatae*.] *B: P. M.* (3116)

Horn, G: H: Revision of the genera and species of the tribe *hydrobiini*. (Proc. Amer. philos. soc., 21 Feb. 1873, v. 13, p. 118-137.)

Rev. by G: H: Horn. (6th ann. rept. trustees Peabody acad. sci., for 1873, 1874, p. 93.)

Rev., by E. C. Rye. (Zool. rec. for 1873 . . . *Van Voorst*, Lond., 1875, v. 10, p. 248-249.)

Tabular separation of the genera, synoptic tables, descriptions of the genera and species of *berosus*, *chaetarthria*, *laccobius*, *philhydrus*, *hydrobius*, *limnocharis*, and *helopeltis* n. g. *S: H.* (3117)

Le Conte, J: Lawrence. Tabular synopsis of the *rhynchophora* of America. Proc. Amer. philos. soc., 5 Jan. 1877, v. 16, p. 417-424.)

Tabular statement of the number of genera and species and of the geographical distribution of the families and subfamilies, with remarks. *S: H.* (3118)

Linstow, O: Compendium der helminthologie. Ein verzeichniss der bekannten helminthen, die frei oder in thierischen körpern leben, geordnet nach ihren wohnthieren, unter angabe der organe, in denen sie gefunden sind, und mit beifügung der literaturquellen. Hannover, *Hahn*, 1878. t.-p. cover, 22+382 p., 24×15; t. 17×10. 8 M.

Contains introduction, with bibliography; list of animals (including 47 orthoptera, 4 neuroptera, 73 coleoptera, 19 hymenoptera, 65 lepidoptera, 7 diptera, 6 hemiptera, 3 myriapoda and 10 arachnida) with the helminths which are found in them. Free-living helminths and literature concerning them. Index. *G: D.* (3119)

Lintner, Joseph Albert. Description of a new species of *eudamus*. (Can. entom., April 1881, v. 13, p. 63-65.)

Describes *e. electra*, new species from Hamilton, Ontario, Canada. *G: D.* (3120)

Lintner, Joseph Albert. On the life duration of the heterocera, moths. (Can. entom., Nov. 1881, v. 13, p. 217-220.)

Rev. (Amer. nat., Nov. 1881, v. 15, p. 912.)

Paper read before the American association for the advancement of science, at Cincinnati, August 1881; containing notes on the longevity of heterocerous lepidoptera. *A. K. D.* (3121)

Lockwood, S: Mussel and insect climbers. (Amer. nat., Sept. 1881, v. 15, p. 737.)

The black mussel, *mytilus edulis*, climbs in a similar manner, with its byssus, as does the larva of *aspidisca saliciella*, with its silk. *G: D.* (3122)

Marx, G: On some new tube-constructing spiders. (Amer. nat., May 1881, v. 15, p. 396-400, fig. 1-8.)

Describes and figures nests of two species of spiders for which the author proposes, without describing the species, the names *tarentula* [*sic*] *nidifex* (♀ figured) and *t. pikei* (♂ and ♀ figured). *G: D.* (3123)

Mead Theodore Luqueer. *Limenitis eros* versus var. *floridensis*. (Can. entom., April 1881, v. 13, p. 79-80.)

Criticism of H. Strecker's "On a lately described species of *limenitis*" (Can. entom., Feb. 1881, v. 13, p. 29-30) [Rec., 2733]. *G: D.* (3124)

Meeting of the sub-section of entomology of the American association for the advancement of science. (Can. entom., 1881, v. 13: Sept., p. 179-189; Oct., p. 214-216.)

Report of proceedings and discussions at the meeting, including address of the president, J. G. Morris, in full (p. 184-189). *A. K. D.* (3125)

Migration of butterflies. (Amer. nat., July 1881, v. 15, p. 577.)

Notes migration of *pieris monuste* in South Carolina. *G: D.* (3126)

Moffat, J: Alston. [*Calosoma scrutator.*] (Can. entom., Jan. 1881, v. 13, p. 18-19.)

Large numbers of *c. scrutator* driven ashore on Lake Erie; notes on their odorous discharge. *G: D.* (3127)

Moffat, J: Alston. Entomological notes. (Can. entom., Aug. 1881, v. 13, p. 175.)

Note on the occurrence of *saperda fayi* in large numbers. *A. K. D.* (3128)

Moffat, J: Alston. [*Papilio cresphontes.*] (Can. entom., May 1881, v. 13, p. 115.)

Notes on larvae, pupae, and imagos of *p. cresphontes.* *G: D.* (3129)

Moffat, J: Alston. Swarming of *archippus.* (Can. entom., Feb. 1880, v. 12, p. 37.)

Assembling of *danais archippus* in great numbers near Hamilton, Ontario, Canada. *G: D.* (3130)

Mojsisovics, August. Leitfaden bei zoologisch-zootomischen präparirübungen für studirende. Leipzig, *W. Engelmann*, 1879 [Dec. 1878]. t.-p. cover, 8+232 p., 24×16, t 18.5×11.4. 110 fig. 8 M.

Modes of dissecting animals; dissection of arthropoda [p. 183-190] especially illustrated by mode of dissection of *melolontha vulgaris*, of which the heart, male and female sexual organs, mouth-parts, and digestive system are illustrated. *G: D.* (3131)

Morris, J: Godlove. [Address as president of the entomological subsection of the American association for the advancement of science, at its Cincinnati (Ohio) meeting (1881).] (Can. entom., Sept. 1881, v. 13, p. 184-189.)

Obituary notice of S: S. Haldeman, and notice of the working entomologists of the United States forty years ago; number of entomological students and the extent of their writings now in the United States; notices of the entomological journals of North America and their special work; suggestions for the further advancement of our knowledge of North American insects and entomological collections. *A. K. D.* (3132)

Moseley, H. N. Notes on the species of *peripatus* and especially on those of Cayenne and the West Indies. (Annals and mag. nat. hist., Apr. 1879, s. 5, v. 3, p. 263.)

Gives notes on various species of *peripatus*, with especial reference to the number of pairs of legs. *R. H.* (3133)

[**Müller**, Hermann.] Häufiges auftreten von *chlorops nasuta* Schrnk. (Entom. nachrichten, 1 Jan. 1881, jahrg. 7, p. 17.)

Great periodical abundance of the above species in Lippstadt, Germany. *G: D.* (3134)

Murray, W: [*Papilio cresphontes.*] (Can. entom., June 1880. v. 12, p. 120.)

Emergence of *papilio cresphontes* from pupa in January. *G: D.* (3135)

Myers, Justus Matthew Theobolt. Habits of *xylotrechus convergens.* (Amer. nat., Feb. 1881, v. 15, p. 151.)

Brief notes on habits of the larva of this beetle, which feeds upon red haw [*Crataegus tomentosa*]. *G: D.* (3136)

Packard, Alpheus Spring, *jr.* The brain of the embryo and young locust. (Amer. nat., May 1881, v. 15, p. 372-379, pl. 4-5.)

Structure of the brain of young of *caloptenus spretus*, studied by sections. A continuation of author's "The brain of the locust" (*op. cit.*, April, p. 285-302, pl. 1-3) [Rec. 3138]. *G: D.* (3137)

Packard, Alpheus Spring, *jr.* The brain of the locust. (Amer. nat., April 1881, v. 15, p. 285-302, pl. 1-3.)

Structure of the brain of *caloptenus spretus* studied by sections. Continuation by author under title, "The brain of the embryo and young locust" (*op. cit.*, May, p. 372-379, pl. 4-5) [Rec., 3137]. *G: D.* (3138)

Packard, Alpheus Spring, *jr.* *Scolopendrella* and its position in nature. (Amer. nat., Sept. 1881, v. 15, p. 698-704, fig. 1.)

Discusses structure and affinities of *scolopendrella*, which the author decides to belong to a suborder of *thysanura*, equivalent in rank to *collembola* and *cinura*. *G: D.* (3139)

Ragusa, Enrico. Note su alcuni lepidotteri siciliani. (Naturalista siciliano, Nov. 1881. an. 1, no. 2, p. 36-38. pl. 3, figs. 1-3.)

Figures and describes a hermaphrodite of *rhodocera cleopatra;* notes on some other species of sicilian lepidoptera, and their aberrant forms. *G: D.* (3140)

Ragusa, Enrico. Un *papilio machaon* Lin. lillipuziano. (Naturalista siciliano, Oct. 1881, an. 1, no. 1, p. 24, pl. 1, fig. 9.)

Describes and figures a specimen of *papilio machaon* with an alar expanse of only 42 mm. *G: D.* (3141)

Reed, Edmund Baynes. *Cupes capitata.* (Can. entom., Aug. 1881, v. 13, p. 176.)

Abundance of *cupes capitata* in London, Ont. *A. K. D.* (3142)

v. **Reizenstein**, L. A new moth. *Smerinthus cablei.* (Scribner's monthly [N. Y.], Oct. 1881, v. 22, p. 864-866, fig.)

Describes larva and imago (figured) of *s. cablei* n. sp., feeding on *pontederia* in Lousiana; list of the 7 U. S. species of *smerinthus;* systematic relations of this species. *B: P. M.* (3143)

Religious culture of the young. The world we live in. Study 22. The animal kingdom, except man. Articulates. (Free religious index, 17 Nov. 1881, v. 13, p. 238. 29 cm.)

Questions, selected quotations, and suggestions for teaching a class about insects, crustacea, spiders and worms. *G: D.* (3144)

Rupertsberger, Mathias. Biologie der käfer Europas. Eine uebersicht der biologischen literatur gegeben in einem alphabetischen personen- und systematischen sach-register nebst einem larven-cataloge. Linz a. d. Donau, 1880. t.-p. cover, 12+295 p., 21.5×14, t 18×11. Pap., 6 M.

Rev., entitled "Natural history of coleoptera." (Amer. nat., May 1881, v. 15, p. 384.)

Bibliography of the writings on the biology of the European species of coleoptera, under the names of the authors and under the names of the families, genera, and species; notes in regard to the best figures of the larvae and pupae. *A. K. D.* (3145)

Saunders, W: Annual address of the president of the Entomological society of Ontario. (Can. entom., Oct. 1881, v. 13, p. 197-205.)

General account of the late progress of entomology, especially in an economic direction. *A. K. D.* (3146)

Saunders, W: Entomology for beginners. (Can. entom., June 1881, v. 13, p. 117-119.)

Describes larva, and figures and describes imago of *alaus oculatus;* figures *lucanus dama*, of which larva and imago are described. *G: D.* (3147)

Saunders, W: Entomology for beginners. The legged maple borer, *aegeria acerni*, Clemens. (Can. entom., April 1881, v. 13, p. 69-70, fig. 6.)

Figures and describes larva, chrysalis, imago, and borings in wood, of *aegeria acerni*. *G: D.* (3148)

Saunders, W: Entomology for beginners. The red-humped apple tree caterpillar, *notodonta concinna*. (Can. entom., July 1881, v. 13, p. 138-140.)

Describes and figures mature larva, chrysalis, and imago; mode of destroying the larvae. *A. K. D.* (3149)

Saunders, W: Entomology for beginners. The satellite sphinx, *philampelus satellitia* Linn. (Can. entom., March 1881, v. 13, p. 41-43, fig. 4-5.)

Figures and briefly describes the larva, pupa and imago of *philampelus satellitia*. *G: D.* (3150)

Schilde, Johannes. Eine hornlose raupe von *smerinthus populi*. (Entom. nachrichten, 15 March 1881, jahrg. 7, p. 100.)

Deformity of larva of *smerinthus populi*. *G: D.* (3151)

S[immonds], P. L. Insects as food. (Journ. of applied sci., 1881, v. 12: June, p. 82-84, 102 cm.; July p. 98-100, 134 cm.; Aug. p. 113-114, 79 cm.)

Compiled accounts of the uses of insects as food in ancient and modern times. *G: D* (3152)

Schönfeldt,——. Ein monströser *prionus insularis* Motsch. (Entom. nachrichten, 15 April 1881, jahrg. 7, p. 121.)

Left antenna absent. *G: D.* (3153)

Speyer ["**Speier**"], Adolph. Ein lepidopterologischer rückblick auf den sommer kes jahres 1879. (Entom. nachrichten, 1881, jahrg. 7: 15 May, p. 145-152; 1 June, p. 157-162.)

On the abundance of *vanessa cardui* and *plusia gamma* during 1879. *G: D.* (3154)

Stein, R: Tenthredinologische studien. 1. Die parthenogenesis von *hylotoma rosa* L. (Entom. nachrichten, 15 Oct. 1881, jahrg. 7, p. 288-294.)

Experiments on parthenogenesis of *h. rosa;* from these and other experiments the author concludes that probably "the possibility of parthenogenetic multiplication is peculiar to all or at least to most *tenthredinidae*." *G: D.* (3155)

Strecker, Herman. Description of a new species of *trochilium*. (Can. entom., July 1881, v. 13, p. 156.)

Describes *trochilium grande* n. sp., from Texas. *A. K. D.* (3156)

Tallant, W. N. [*Terias nicippe.*] (Can entom., May 1881, v. 13, p. 115.)

Terias nicippe rare about Columbus, Ohio, in 1879, and abundant in 1880. *G: D.* (3157)

Todd, James E. *Asilus* and *libellula*. (Amer. nat., Dec. 1881, v. 15, p. 1005.)

Asilus captures a *libellula*. *G: D.* (3158)

Todd, James E. Terns as fly-catchers. (Amer. nat., Dec. 1881, v. 15, p. 1005.)

Hydrochelidon lariformis catches and eats dragonflies. *G: D.* (3159)

United States national museum (*Smithsonian institution*), *Washington, D. C.* No. 4. Circular concerning the department of insects. [Wash.], 1 Jan. 1882. 1 p., 25×16.

Reprint. (Proc. U. S. nat. mus., for 1881, 1882, v. 4; App., no. 4.)

Abstract. (Psyche, Feb. [24 May] 1882, v. 3, p. 315.)

Notice, by S. F. Baird, of C: V. Riley's private collection of insects, deposited in the U. S. national museum; request for contribution of specimens to the museum. *B: P. M.* (3160)

Weidinger, G. Libellenschwarm. (Entom. nachrichten, 15 June 1881, jahrg. 7, p. 187-188.)

Flight of males of *libellula quadrimaculata* over Dresden, Saxony, on 28 May 1881. *G: D.* (3161)

ENTOMOLOGICAL ITEMS.

DR. ANTON STUXBERG, of Stockholm, has been appointed director of the natural history museum in Göteborg, Sweden, to fill the place of Prof. A. W. Malm, who died in March 1882.

MR. CHARLES FISH, of Brunswick, Me., has been obliged to give up the study of the *pterophoridae* and has transferred his collection of that family to Prof. C. H. Fernald, of Orono, Me.

THE NECROLOGY for the preceding year, which has annually formed a part of the Bibliographical Record for each February numero of PSYCHE, will be a part of the March numero this year.

MR. HENRY G. DAMMER, 938 Broadway, St. Louis, Mo., is desirous of obtaining specimens of lepidoptera, including European species. Catocalas from the eastern United States are particularly desired.

PROF. E. METSCHNIKOFF, the widely known author of papers on the embryology of insects, has left the University of Odessa, Russia, and Prof. W. Salensky of the University of Kasan is called to fill his place.

MR. L. O. HOWARD has found that pyrethrum increases the heart-beat of the larvae of *plusia brassicae* from its normal rate of from 44 to 68 beats per minute to 150 to 164 beats, after which it subsided to 140 beats and just before death to 130 beats per minute.

AN INTERESTING series of papers by Rev. W. W. Fowler, under the title "Natural localities of British coleoptera" is in progress in *The Entomologist*. Altho the species treated of are British the methods of collecting described in the paper make it well worth perusal.

DR. M. SCHLUGIN recommends, in the *Zoologischer Anzeiger*, a mixture of paraffin and ceresin as an imbedding material in cutting sections with the microtome. Ceresin is similar to wax but firmer and more tenacious. This mixture is somewhat hard, but if a softer one is desired a little vaselin is added.

PRESERVATION OF HONEY. Honey, according to A. Vogel, contains on an average one per cent of formic acid. Observing that crude honey keeps better than that which has been clarified, E. Mylius has tried the addition of formic acid, and found that it prevents fermentation without impairing the flavor of the honey.—*Sci. amer.*, 18 Nov. 1882, v. 47, p. 324.

THE U. S. Commissioner of Agriculture authorizes the editors of PSYCHE to announce that copies of his annual Reports for 1881-1882 will be sent to any entomologist who applies for them. Mr. Mann has made out a list of most of the principal entomologists, to whom the reports have been sent, and will be pleased to see that copies are sent to any others who may wish them.

AT THE meeting of the Academy of Natural Sciences of Philadelphia, 30 May 1882, Professor Leidy called attention to the abundance of the ant *Lasius interjectus* in the neighborhood of Philadelphia. It is habitual with this ant to care for an Aphis and a Coccus, both of which it guards in flocks. He described a particular nest under a flat stone, containing six distinct and closely crowded groups of the pale yellowish Aphis, and five of the red Coccus.—*Amer. nat.*, Jan. 1883, v. 17, p. 118.

COLLECTING COLEOPTERA. "The large coarse tufts of grass that are to be found in almost every field are very productive if cut round with a sharp knife, lifted gently, and then inverted and shaken over paper. This is a very good method of collecting in winter, as it is almost certain to produce something, if all else has failed. Almost any beetle may be found in this way, as the tufts are favourite hybernating places; *staphylinidae*, however, especially *Steni*, are the commonest."—W. W. Fowler in *The Entomologist*, Oct. 1882, v. 15, p. 231-232.

PROTECTIVE CHANGE of color in a spider.—I suppose you know the little flower spiders, that conceal themselves in the flowers, and seize any unwary insect that may chance to come within their reach. I have generally

found them white and yellow. I suspected they changed their color, and by experiment, I find that this is so. If I take a white one and put it on a sunflower, it will get quite yellow in from two to three days. I believe they capture almost anything, but they seem to be partial to the bees. I found one the other day with a wasp, the latter was not yet dead, but it was tightly held by the throat by the spider. The next day the wasp was found lying dead under the flower.—James Angus, in *Amer. naturalist*, Dec. 1882, v. 16, p. 1010.

NOTICE TO SUBSCRIBERS.

The concluding numeros of volume three of PSYCHE, for the publication of which the undersigned is responsible, will be issued as rapidly as possible. It was deemed, however, inadvisable for the club to delay longer commencing volume four. As usual, the cause of the delay in the issue of PSYCHE has been the lack of good material for publication. Articles of the greatest permanent value in entomology are hard to obtain for the reason that they are not hurried into print by their authors to gain priority.

GEORGE DIMMOCK.

SOCIETY MEETINGS.

THE REGULAR meetings of the Cambridge Entomological Club will be held at 7.45 p. m., on the days following:—

13 Oct. 1882.	9 Mar. 1883.
10 Nov. "	13 Apr. "
8 Dec. "	11 May "
12 Jan. 1883.	8 June "
9 Feb. "	

G. DIMMOCK, *Secretary.*

THE NEW YORK Entomological Club meets twice monthly, except in June, July and August, but no special date is fixed for each meeting.

HENRY EDWARDS, *Secretary.*

THE REGULAR meetings of the Entomological Section of the Boston Society of Natural History will be held at N. W. corner of Berkeley and Boylston Sts., Boston, Mass., at 7.45 p. m., on the days following:—

25 Oct. 1882.	28 Feb. 1883.
22 Nov. "	28 Mar. "
27 Dec. "	25 Apr. "
24 Jan. 1883.	23 May "

EDWARD BURGESS, *Secretary.*

THE REGULAR meetings of the Entomological Section of the Academy of Natural Sciences, of Philadelphia, Pa., will be held at S. W. corner of 19th and Race Sts., on the days following:—

14 Oct. 1881.	10 Mar. 1882.
11 Nov. "	14 Apr. "
9 Dec. "	12 May "
13 Jan. 1882.	9 June "
10 Feb. "	

JAMES H. RIDINGS, *Recorder.*

THE SEMI-ANNUAL meetings of the American Entomological Society will be held at S. W. corner of 19th and Race Sts., Philadelphia, Pa., on the days following:—

12 Dec. 1881.	12 June 1882.

JAMES H. RIDINGS, *Recording Secretary.*

THE REGULAR monthly meetings of the Montreal Branch of the Entomological Society of Ontario, will be held at Montreal, Que., Canada, on the days following:—

3 Oct. 1882.	6 Feb. 1883.
7 Nov. "	6 Mar. "
5 Dec. "	3 Apr. "
9 Jan. 1883.	1 May "

G. J. BOWLES, *Secretary.*

THE REGULAR meetings of the Brooklyn Entomological Society will be held at 9 Broadway, Brooklyn, E. D., N. Y., on the days following:—

28 Oct. 1882.	31 Mar. 1883.
25 Nov. "	28 Apr. "
30 Dec. "	26 May "
27 Jan. 1883.	30 June "
24 Feb. "	

F. G. SCHAUPP, *Secretary.*

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Vol. 4. No. 107-108.

MARCH–APRIL 1883.

CONTENTS:

ADVERTISEMENTS 22
THE SCALES OF COLEOPTERA. — *George Dimmock* 23–27
HOMINIVOROUS HABITS OF LUCILIA MACELLARIA, "THE SCREW WORM"—*Francis Huntington Snow* 27–30
FALSE DATES 31–32
PROCEEDINGS OF SOCIETIES. — Academy of Natural Sciences of Philadelphia . 32
NECROLOGY FOR 1879, 1880, 1881 AND 1882—BIBLIOGRAPHICAL RECORD, no. 3162–3234 33–38
ENTOMOLOGICAL ITEMS — Society Meetings 39–40

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EARLY STAGES OF BUTTERFLIES WANTED.

The undersigned desires to obtain, by exchange or otherwise, from all parts of the world, eggs caterpillars and chrysalids of Diurnal Lepidoptera. Dried specimens are preferred, especially of caterpillars, which should be prepared by inflation. Correspondence is invited with persons engaged in the study of the early stages of butterflies.

S. H. SCUDDER,
Cambridge, Mass.

COCCIDAE WANTED.

The undersigned is desirous of obtaining, by exchange or otherwise, specimens of as many species of the COCCIDAE as possible, for the purpose of making a study of the North American forms. Those found infesting cultivated plants especially desired. Living specimens preferred when they can be obtained.

J. HENRY COMSTOCK,
Department of Entomology,
The Cornell University,
Ithaca, N. Y.

GALLS AND GALL INSECTS.

The undersigned desires, either by exchange or otherwise, Galls from all parts of the United States. He is especially interested in those made by *Lepidoptera, Coleoptera, Homoptera and Diptera.* Correspondence in reference to Gall growths, or other vegetable abnormities, is invited. CHARLES V. RILEY,
1700 Thirteenth St., N. W.,
Washington, D. C.

TORTRICIDAE WANTED.

I am desirous of obtaining as many North American TORTRICIDAE as possible, for the purpose of studying this family. I shall be glad to name and return any TORTRICIDAE forwarded to me for this purpose, save such as may prove new and desirable to retain for description.

Pack carefully, and direct to
PROF. C. H. FERNALD, Orono, Me.

LEPIDOPTERA.

Living cocoons, pupae and ova of American lepidoptera bought or exchanged for other species. by Monsieur ALFRED WAILLY, (Membre-Lauréat de la Société d'Acclimatation de France),
Tudor Villa, Tudor Road, Norbiton,
Kingston-on-Thames, England.

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PSYCHE.

THE SCALES OF COLEOPTERA.

BY GEORGE DIMMOCK, CAMBRIDGE, MASS.

(*Continued from page 11.*)

SCALES OF HOPLIA.

A few only of the scales from the upper side of this insect are colorless, and, as these seem to be undeveloped or immature, I tried no experiments upon them.

The scales of the under side of *H. coerulea* are purple, purplish red, red, bluish and colorless by transmitted light, and by reflected light they are silvery white with a tendency to metallic green in places. The scales of the tip of the abdomen, altho really dorsal in position, are covered with spines, are mostly reddish or purple by transmitted light, and are metallic green by reflected light. Some of the scales of the legs are like those from the rest of the under surface of the insect; others of them are lanceolate (fig. 3, *c*), and colorless or milk-white, but covered with longer spines or hairs than the more circular forms of scales. The hairs of this insect have fine branches, as do the hairs of all *scarabaeidae*, according to Fischer and according to my own observations.

Water, alcohol, chloroform and similar reagents render the scales of the under side colorless and transparent, the colors returning as soon as the scales are dried.

In finer structure the scales of the under side are different from those of the upper side in being clothed with the before-mentioned spines or fine hairs, and in the absence of the fine internal network, which is here replaced in some scales by a more irregular internal marking of like nature.

The scales of *Hoplia modesta*, from this country, are confined to the tip of the abdomen and to the under side of the insect. They are all gray or milk-white by transmitted light, and silvery by reflected light. They are narrower than those from corresponding parts of *H. coerulea*, but are otherwise alike in structure and need no further mention here.

SCALES OF POLYPHYLLA.

The whitish spots upon the elytra of *Polyphylla variolosa* are produced by lanceolate scales, the opake whiteness of which is caused by the large amount of air contained in them. As they present no characters of special interest not to be found in scales of other coleoptera described in this paper I have not drawn them or further studied them.

SCALES OF VALGUS SQUAMIGER.

Nearly every part of *V. squamiger* is covered with scales which are of two colors, an opake dark brown and a semi-opake white. The scales are somewhat rolled and are very brittle, so that when they are pressed beneath a cover-glass upon the microscope slide they usually split at the edges. The unbroken scales are nearly round, about 0.14 mm. long by 0.08 to 0.12 mm. wide, and until they are deprived of air but little structure is visible. When they are deprived of air they are seen to be covered with dense, rather long hairs, — to be in fact almost

Fig. 4. Scale of *Valgus squamiger*. Enlarged 100 diam.

shaggy. Fig. 4 represents an unbroken scale that has been treated with alcohol to remove the air. The hairs, as will be seen by the figure, are arranged, somewhat roughly, in transverse or oblique lines; but what is more curious, the basal ends of these hairs seem to be connected, in each line, with one another, and finally each of these bands of hairs, which may contain from two to twenty hairs, seems to connect by its basal line with a branch going to the basal end, or stem, of the scale. These branches unite as they approach the basal end of the scale until they form one trunk. These ramifications are delicate brown and are beautiful on a preparation of the scales in Canada balsam. In fig. 4, which was made too small to show them correctly, they are proportionally far too coarse, and are not tapered as regularly as they should be from base to tip.

I have not found this ramified structure in any scales except those of *Valgus*, and in them I have not studied it to any extent. It appears as if the cavity of the scale, once open and probably opening into the large hairs, had closed gradually, leaving channel-like folds between the hairs and from them to the stem of the scale. These channels are apparently entirely closed now, altho I made no sections of these scales to absolutely prove this point.

HAIRS OF PSILOPTERA.

The under side of the abdomen and other parts of *Ps. drummondi* are clothed with brownish-yellow hairs, which are set upon a smooth, nearly black surface, and consequently the hairs appear of a light bronze color.

Fig. 5. Hair of *Psiloptera drummondi*. Enlarged 100 diam.

Seen under the microscope these hairs or scales—for they seem to be as much

scales as they are hairs—are sword-shaped (see fig. 5), and of a yellowish color. Their length is from 0.25 mm. to 0.30 mm., their width about 0.01 mm., and they are covered with longitudinal striae, which are usually about 0.001 mm. apart. These hairs or scales are easily seen to contain air by using water or alcohol to drive it out. I introduce them here only to illustrate this somewhat common form of appendage intermediate between scales and hairs. I have found no other squamiform appendages on the limited number of *buprestidae* which I have examined.

No description has been given, as far as I can discover, of scales in *elateridae*, altho the generic names *Chalcolepis* and *Chalcolepidius*, and the specific names of *Adelocera lepidoptera*, *Lacon leprosus*, *Meristhus lepidotus*, *Monocrepidius lepidus*, *Cryptohypnus squamifer*, and others, would imply that the presence of scales had been either suspected or verified. That the scales of *elateridae* are interesting in form and structure can be seen by the following descriptions of scales of *Chalcolepidius*, of *Alaus* and of an undetermined species of European *elateridae*.

SCALES OF CHALCOLEPIDIUS.

Nearly the whole surface of *C. rubripennis*, except its elytra, is thickly covered with scales, which give to the parts thus covered a peculiar metallic or bronzed aspect, with colors changing from blue to greenish or reddish.

The scales from all parts of this insect are very much alike, varying little in form (see fig. 6, *a*, *b*, and *c*). They are all of ovate form, more or less elongate, with the larger end toward their shank or stem, which is nearly always broken off in removing them from the insect; they are very flat, scarcely convex above, but do not rest very tightly pressed upon the surface of the insect. Their length is from 0.09 to 0.15 mm., their width from 0.02 to 0.04 mm., and their thickness is about 0.0025 mm.

These scales when removed and examined under the microscope are uniformly brown, except with very obliquely transmitted light, when they are sometimes purplish. If, however, they are put upon a black surface and illumi-

Fig. 6. Different forms of scales from *Chalcolepidius rubripennis*. Enlarged 100 diameters.

nated from above they are brilliant with blue, red and green, the color depending upon the position of the surface of the scale with reference to the light. Put in direct sunlight, on a black surface, and the microscope focussed somewhat above them, the light is decomposed in fine lines of brilliant blue, green and red, as if series of solar spectra were drawn up near each other, thus indicating striation of the scale-surface. The scales have a very slight tendency to longitudinal folding, but no striae, or really distinct

folds, are visible upon them. The shank and a little of the basal portion of the scales are hollow; whether the whole scale is hollow I have not determined.

Treatment with water, alcohol, glycerin or turpentin does not seem to affect the scales of *Chalcolepidius*, which appear to contain no air. They are not bleached by chlorin bleaching reagents.

SCALES OF ALAUS.

The two velvety black spots upon the dorsal surface of the thorax of *A. oculatus*, to which this insect owes its specific name, are formed of scales, as are also all the white portions of the beetle, the ground color of the whole insect being a slightly shining black. The same remarks apply to *A. myops*, the scales of which are like those of *A. oculatus* in every respect.

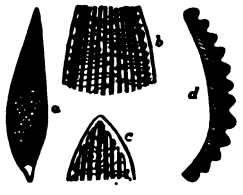

Fig. 7. Scales of *Alaus oculatus: a*, brown scale; *b* and *c*, portions of white scales to show cross-bands; *d*, transverse section of a brown scale. Enlargement: *a*, 100 diam.; *b* and *c*, 300 diam.; *d*, 500 diam.

The form of all the scales of *A. oculatus* is scaphoid, with the concave side toward the insect. The scales are striate on the convex side, but smooth on the concave side. Fig. 7, *a*, illustrates their form, the lower end being the one attached to the insect. In some cases the shank by which the scale is attached is proportionally longer than is shown in the figure. These scales are inserted by their shanks in holes irregularly distributed in the chitinous covering of the insect. The irregular arrangement, peculiar form and striation, and mode of insertion of the scales of *A. oculatus* forcibly remind one of the leaves in a bed of lily-of-the-valley (*Convallaria*) when these leaves are blown toward one direction by a gentle breeze.

The scales of *A. oculatus* are all of about the same size—about 0.20 to 0.23 mm. long by 0.04 to 0.05 mm. wide, and 0.005 mm. in greatest thickness—from whatever part of the insect they are taken. Those which form the two black thoracic spots are deep brown when seen under the microscope, and the others are opake white when dry. The striae of these scales are about 0.0025 mm. apart, and converge somewhat toward each end of the scales. The striae of the white scales are a little less distinct than are those of the dark scales, the whole white scale, to appearance, when viewed with a low-power microscope, being covered with minute cross-lines, so numerous as to give the scale an opake white color. Under higher magnifying power these transverse lines present an appearance as in fig. 7, *b* and *c*. The longitudinal striae are above the transverse lines, i.e., on the convex side of the scales, while the cross-lines extend as interrupted, transverse bands across the lower or concave part of the scales. No transverse bands are visible, even after re-

moving the air, in the brown scales. In the white scales the bands usually start out from or beneath the marginal longitudinal stria of the upper side of the scale, and extend beneath the other longitudinal striae toward the middle of the scale (see fig. 7, *b* and *c*); exceptionally, however, they begin beneath one of the other longitudinal striae.

(*To be continued.*)

HOMINIVOROUS HABITS OF *LUCILIA MACELLARIA*, "THE SCREW-WORM."

BY FRANCIS HUNTINGTON SNOW, LAWRENCE, KANSAS.

I have from time to time had occasion to note the depredations of the screw-worm upon horses and cattle in this state, but until recently have not received positive evidence of its attacks upon human subjects in any locality so far north as Kansas. But early in September, 1882, I received from Mr. S. D. Osborn, the postmaster at Varck, in Southeastern Kansas, specimens "of the worms which came from the nostrils of Milton Carter." These proved to be the larvae of *Lucilia macellaria* Fab., the so-called "screw-worm." Upon further inquiry I learned that upwards of one hundred full-grown maggots escaped from the nose of this patient, who finally recovered from the serious illness consequent upon their ravages. I also ascertained that Mr. Carter had long been afflicted with an offensive nasal catarrh, which made his nostrils an attractive place for the oviposition of the fly, and that he had fallen asleep in the woods in the daytime only a few days before the first appearance of the symptoms produced by the presence of the larvae.

Several other instances of the attacks of *Lucilia* upon man soon came to my knowledge, most of which led to fatal results. Among these I will select the case attended by Dr. J. B. Britton, of Mapleton, in southeastern Kansas, who reported it in full at the session of the Southeast Kansas District Medical Society, in January, 1883. From this report I condense the following account: "On the evening of August 22d, 1882, Mr. M. E. Hudson complained of a peculiar sensation at the base of the nose and along the orbital processes, which was first followed by inordinate sneezing, and later by a most excruciating pain over the os frontis, also involving the left superior maxillary. This patient also had suffered, and was still suffering, from an aggravated form of nasal catarrh. The discharge was quite purulent, of a yellowish color frequently tinged with blood, with a disagreeable odor and at times intolerably offensive. On the 24th there was a profuse discharge of much purulent matter from the nostril and mouth, when all pain instantly

subsided. This discharge continued for three days, during which time as much as sixteen ounces escaped, increasing in consistency until it was pure pus. The odor becoming much more offensive, his cough was more troublesome and fever increased to such an extent as to produce slight delirium for twelve hours. What was thrown off was with much difficulty expectorated, and was sanious, containing microscopic particles of osseous matter, together with flakes of plastic exudation. The os hyoides was evidently destroyed. The patient had spoken with difficulty for thirty-six hours and there was much trouble in swallowing. The soft palate had evidently given way and there was an entire inability to protrude the tongue or use it in speech.

"About this time a worm similar to a maggot dropped from his nose. That was the first indication or suspicion that there was anything of the kind present. There was not, as in some other cases reported, any swelling, or movements traceable under the skin, nor was there at any time any complaint of the patient, calculated to lead to a knowledge of their presence. After the appearance of the first, I expected more, and was surprised to see them drop from the nostrils and wiggle from the mouth without any discomfort to the patient until they came in contact with the Schneiderian membrane, when they annoyed him greatly, and every effort was made on his part to expel them; but so soon as expelled, no further trouble was manifested until another would get into the nostril. Every effort was made on my part to discover them under the tissue, but the soft palate being destroyed to a great extent, and the palatine arch apparently lowered, it was with much difficulty that an examination could be made. The worms were evidently burrowing under the palatine fascia, as it presented a honey-combed appearance and in places patches were totally destroyed as large as a dime [18 mm.]. They continued to drop from the mouth and nose, forced from the nostrils by the efforts of the patient, for the following forty-eight hours, during which time 227 were counted and the estimated number exceeded 300. At this time the whole of the soft palate was destroyed. The patient lived four days after the last worm came away.

"I put five of the worms in dry earth and in fourteen days from the time they dropped from the nostril there hatched out three flies.

"Upon a very minute and careful examination after death I was astonished to find that all the tissue covering the cervical vertebrae, as far down as I could see by throwing the head back and compressing the tongue, was wholly destroyed and the vertebrae exposed. The palatine bones broke with the slightest pressure of the finger. The os hyoides was destroyed and the nasal bones loose, only held in position by the superficial fascia.

"My own theory is that the fly deposited the eggs while the patient was asleep, probably the day previous to

the peculiar sensation and sneezing first complained of. At that time they had acquired vitality enough to annoy him while in contact with the sound flesh. So soon as they came in contact with the unsound flesh, or that affected with the catarrh, being as it must have been gangrenous, they gave no further trouble."

Dr. Britton forwarded to me specimens of the fly, bred as above stated, which I identified as *Lucilia macellaria* Fab. In order, however, that there might be no possibility of error, I submitted them to Dr. S. W. Williston, of New Haven, Conn., who corroborated this determination and furnished the following notes concerning the species: "The specimens are evidently *Lucilia* (*Campsomyia*) *macellaria* Fab., a fly common from the Argentine Republic to Canada, and which from its variations has probably received more specific names (20!) than any other American fly. It belongs to the *Muscidae* (true) and is not far from *Musca*. Their hominivorous propensities have gained for them the synonyms of *Lucilia hominivorax* Coquerel, and *L. hominivorus* Cenil (S. America)."

In the Peoria (Ill.) Medical Monthly for February, 1883, Dr. Joshua Richardson, of Moravia, Iowa, has an article upon "The screw-fly and its ravages," from which I make the following extracts: "While travelling in Kansas in the latter part of last August a citizen of this place had the misfortune to receive while asleep a deposit of eggs from this fly. He had been troubled for years with catarrh, hence the attraction to the fly. He returned home a few days after the accident and shortly after began complaining of a bad cold. Growing rapidly worse, I was called to attend him. Monday, my first day, his appearance was that of a man laboring under a severe cold. Had slight congestion of the lungs, and moderate grade of fever. His nose seemed greatly swollen and he complained of a smarting, uneasy feeling in it, and general misery through the head. Gave him treatment to relieve the congestion and fever. Tuesday saw him again. His nose and face were still more swollen, and in addition to the other symptoms he was becoming slightly delirious and complained a great deal of the intense misery and annoyance in his nose and head. A few hours after, I was sent for in haste with the word that something was in his nose. I found on examination a mass of the larvae of this fly (or "screw-worms" as they are commonly called in the south) completely blocking up one nostril. On touching them they would instantly retreat *en masse* up the nostril. Making a 20 per cent solution of chloroform in sweet milk I made a few injections up both nostrils, which immediately brought away a large number, so that in a few hours I had taken away some 125 of them. By Wednesday evening erysipelas had begun, implicating the nose and neighboring portions of the face. Another physician was called. By continual syringing with a strong antiseptic solution of

salycilate of soda, bicarbonate of soda and carbolic acid we hoped to drown out the remaining larvae. But they had by this time cut their way into so many recesses of the nose and were so firmly attached that we were unable to accomplish much. Finally we resorted to the chloroform injections, which immediately brought away a considerable number. Friday I was able to open up two or three canals that they had cut, extracting several more that had literally packed themselves one after another in these fistulous channels. His speech becoming suddenly much worse, I examined the interior of his mouth and found that a clear-cut opening had been made entirely through the soft palate into his mouth and large enough to insert the end of a common lead pencil. Saturday the few remaining larvae began changing color and one by one dropped away. On Sunday for the first time hemorrhage from both nostrils took place, which continued at intervals for three days but was not at any time severe. On this day the patient began to improve, the delirium and erysipelas having subsided, leaving but little or no annoyance in his head. In a few days he became able to go about home, and even to walk a distance of half a mile to visit a friend and return. But while there he began complaining of a pain in the neighborhood of his left ear, apparently where the eustachian tube connects with the middle ear. It proved to be an abscess. Being already so reduced by the first attack, he was unable to withstand the second, and died after an illness of nearly three weeks, completely exhausted by his prolonged sufferings. Three days before his death the abscess discharged its contents by the left nostril. The quantity of pus formed was about 2½ ounces [78 grams].

"In all about 250 larvae were taken away from him during the first attack, and, as the visible results, not only had they cut the hole through the soft palate, but had also eaten the cartilage of the septum of the nose so nearly through as to give him the appearance of having a broken nose. The case occupied, from the first invasion of the fly to its final result, nearly two months. He doubtless would have recovered but for the formation of the abscess, which, from all the symptoms, was caused by one or more of the larvae having found their way up the left eustachian tube."

Dr. Richardson also quotes the Rev. William Dixon, of Green. Clay Co., Kansas, as giving the following account of his own experience:

"While riding in his buggy a few years ago in Texas, a screw-fly attacked him flying up one nostril. He blew it out, when it dashed up the other and deposited its eggs before he was able to expel it. Not realizing the danger he did nothing for about three days, when the pain became so great that he hastened to Austin to consult a physician. His soft palate was almost destroyed before the larvae, over 200 in number, were expelled." This was the only one of twelve cases known to Dr. Richardson in which the patient recovered.

PSYCHE.

CAMBRIDGE, MASS., MAR.-APR. 1883.

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FALSE DATES.

So far as our examination has gone, we have not learned that is was the custom of any scientific periodical to publish the actual date of its issue in a systematic manner, before such a practice was adopted in PSYCHE. Whether PSYCHE was or was not a pioneer in this direction is of little importance compared with the importance of the principle thus illustrated. We are pleased to notice the adoption of this practice in one and another of our contemporaries. PSYCHE has practised it from the outset.

With the concluding numero of its last finished volume (December 1882), the *Canadian entomologist* began to print, *on the numero*, the date of printing of each numero of its issue. How much better it would be to announce, in one numero, the date of actual issue of the preceding! Accidents frequently occur, after a signature, or a numero, is partly or even wholly printed, to delay its issue beyond the expected date, and the signatures cannot be, in that case, thrown away, or their date changed, without loss or trouble which will rarely be incurred. No reliance, in most cases, therefore can be placed on such an announcement. As an announcement of date of printing and not of date of issue, it has no value in a question of priority. The announcement, if intended as a statement of the date of issue, is positively false, in that it is made in advance of issue; however strictly the fact may be made subsequently to coincide with the announcement. In case, however, the announcement is made after the event, it has a positive value.

It is rarely the case that so excellent an opportunity of illustrating the evils of the practice of putting the date on the signature to which it refers is given, as in the statements of dates of issue which are appended to the last two volumes of the Proceedings of the Boston society of natural history. It is probable that a similar discrepancy between the pre-announced and the actual dates of issue occurs in the issue of the proceedings of many other societies, but in general there is no means of detecting the discrepancy. Even here it is not until two or three years after the issue of the first signatures before the true date of issue is made known. Meanwhile, what misunderstandings might arise, either controversially or privately, from the erroneous impression conveyed by the dates printed on the signatures! It will be noticed, in the lists given below, especially from volume 20 of the Proceedings, in how many cases the announcement is false, and how great, in many cases, is the discrepancy.

Dates of actual publication of the Proceedings of the Boston society of natural history, v. 20 and 21, as compared with the dates printed on the signatures.

Volume 20.

	Announced date.	Actual date of issue.	Discrepancy in days.
p. 1-32,	Dec. 1878	[1 Jan. 1879].	1
p. 33-48,	[22] Jan.	1879.	0
p. 49-80,	Jan.	[5 Feb.] 1879.	5
p. 81-96,	Feb.	[1 Mch.] 1879.	1
p. 97-112,	Mch.	[4 Apr.] 1879.	4
p. 113-128,	[4] Apr.	1879.	0
p. 129-144,	Apr.	[18 June] 1879.	49
p. 145-160,	May	[18 June] 1879.	18
p. 161-176,	July	[4 Aug.] 1879.	4
p. 177-192,	Sept.	[24 Oct] 1879.	24
p. 193-208,	[29] Oct.	1879.	0
p. 209-224,	Oct.	[20 Nov.] 1879.	20

	Announced date.	Actual date of issue.	Discrepancy in days.
p. 225-272,	[20] Nov.	1879.	0
p. 273-288,	Dec.	1879 [5 Feb. 1880].	36
p. 289-304,	Feb.	1880 [17 Dec. 1879].	—46!
p. 305-320,	Jan.	[5 Feb.] 1880.	5
p. 321-352,	Mch.	[7 Apr.] 1880.	7
p. 353-368,	May	[20 Oct.] 1880.	142
p. 369-384,	Aug.	[20 Oct.] 1880.	50
p. 385-400,	Oct.	[3 Nov.] 1880.	3
p. 401-416,	Nov.	1880 [5 Jan. 1881].	36
p. 417-448,	May	[25 June] 1881.	25
p. 449-464,	June	[23 July] 1881.	23
p. 465-480,	[23] July	1881.	0
p. 481-496,	July	[5 Aug.] 1881.	5
p. 497-506,	Sept.	[5 Nov.] 1881.	36

Volume 21.

p. 1-16,	[23] July	1881.	0
p. 17-32,	July	[16 Aug.] 1881.	16
p. 33-48,	[16] Aug.	1881.	0
p. 49 80,	Aug.	[5 Nov.] 1881.	66
p. 81-112,	Sept.	[5 Nov.] 1881.	36
p. 113-128,	Oct.	[5 Nov.] 1881.	5
p. 129-144,	[21] Nov.	1881.	0
p. 145-160,	[28] Nov.	1881.	0
p. 161-176,	[15] Dec.	1881.	0
p. 177-208,	Dec.	1881 [7 Jan. 1882].	7
p. 209-240,	[30] Jan.	1882.	0
p. 241-256,	[7] Feb.	1882 [1882].	(?)
p. 257-272,	Feb.	[4 Mch.] 1882.	4
p. 273 288,	[10] Mch.	1882.	0
p. 289 304,	[18] Apr.	1882.	0
p. 305-320,	[19] May	1882.	0
p. 321-336,	[27] May	1882.	0
p. 337-352,	[15] June	1882.	0
p. 353-368,	June	[6 July] 1882.	6
p. 369-384,	[17] July	1882.	0
p. 385-400,	[6] Sept.	1882.	0
p. 401-416,	[12] Oct.	1882.	0
p. 417-432,	Oct.	[3 Nov.] 1882.	3
p. 433-448,	Jan.	[5 Feb.] 1883.	5
p. 449-464,	[21] Feb.	1883.	0
p. 465-475.	21 Mch.	1883.	0

We commend it to the attention of the editors, not only of the periodicals mentioned, but also of others, whether it would not be well to adopt the principle illustrated in PSYCHE, of giving, at the earliest opportunity, in a systematic manner, the dates of issue of parts *already issued*, and omitting dates of prospective issue.

B. P. M.

PROCEEDINGS OF SOCIETIES.

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

8 AUG. 1882. — The Rev. H: C. McCook described the raids of *Formica sanguinea* upon *F. fusca* — raids in which the black slaves assist their red masters. Reds and blacks shared the labor of raising the young. The nests of *F. fusca*, conspicuous in places where there were no red ants, were hard to find where the latter were common. An attempt to introduce the red ant into a city yard failed through the attacks of the common pavement ant, *Tetramorium caespitum*.

3 OCT. 1882 — Dr. Skinner remarked that the organ of offence of the larva of *Papilio*, usually believed to be solid, is really hollow, rolled in and out upon itself.

10 OCT. 1882. — Rev. H: C. McCook presented a paper upon the snares of orb-weaving spiders, and described four species of *Epeira*.

31 OCT. 1882. — Rev. H: C. McCook drew attention to the use of ants as insecticides by the Chinese, and stated his belief that as no American species lived on trees, the probabilities were against their usefulness for a similar purpose.

7 NOV. 1882. — Rev. H: C. McCook presented a paper on "Ants as beneficial insecticides" and advocated the importation of the ant used in China for the protection of orange trees.

14 NOV. 1882. — Mr. Thomas Meehan stated that the nest of the wood pewee [*contopus virens*] is held together by cobwebs.

5 DEC. 1882. — Dr. Horn remarked upon the singular distribution of the apterous water-beetle *Amphizoa*, one species of which inhabits California, a second the district northward of that state as far as Vancouver's island, while a third has been found high up in the mountains of Thibet.

23 JAN. 1883. — Dr. Skinner stated that *Argynnis cybele*, instead of carefully depositing its eggs, as is usual with butterflies, dropped them from a distance upon the herbage. — Complied from *Amer. nat.*, April 1883, v. 17, p. 462 - 466.

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard: S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

NECROLOGY FOR 1879.

ADDITIONAL TO REC., 1501-1518, 1555, 2125-2142, AND 2648-2653.

Berce, Jean Étienne, biog. sketch of.

CLEMENT, A. L. Notice nécrologique sur Jean Étienne Berce. (Ann. soc. entom. France, 1880, s. 5, v. 10, p. 177-180.)

Mr. Berce, a lepidopterist, was b. at Saint Dié, dept. Vosges, France, 24 April 1803 [not 1802]; d. 29 Dec. 1879, at Paris, France. [*See* Rec., 2126.] *G: D.* (3162)

Boisduval, Jean Baptiste Alphonse Déchaffour, biog. sketch of.

GIRARD, Maurice. Notice nécrologique sur le Dr. de Boisduval. Extrait du Journal de la société centrale d'horticulture de France, 3e série, II, 1880, p. 422-426. Paris, 1880. 6 p., 22×14, t 17×9.5.

[*See* Rec., 2127 *and* 2648.] *G: D.* (3163)

NECROLOGY FOR 1880.

ADDITIONAL TO REC., 2143-2168 AND 2654-2655.

Guenée, Achille, biog. sketch of.

MABILLE, Paul. Notice nécrologique sur Achille Guenée. (Ann. soc. entom. Fr., s. 6, v. 1, p. 5-12.)

[*See* Rec., 2149.] *G: D.* (3164)

Haldeman, S: Stehman, biog. notice of. (Can. entom., Sept. 1881, v. 13, p. 184-185.)

BRINTON, D. G. Samuel Stehman Haldeman. (Proc. Amer. philos. soc., Feb. 1881, v. 19, p. 279-285.)

HART, C: H: Samuel Stehman Haldeman. (Penn. monthly, Aug. 1881, v. 12, p. 584-601.)

Dr. Haldeman was b. 12 Aug. 1812 at Locust Grove, Lancaster Co., Pa.; d. 10 Sept. 1880, in Chickis, Pa. [*See* Rec., 2151.] *G: D.* (3165)

Kiesenwetter, Ernst August Hellmuth, biog. sketch of.

KRAATZ, Gustav. Denkblätter an H. v. Kiesenwetter. (Deutsche entom. zeitschr., 1880, jahrg. 24, p. 323-336.)

The above notice includes a list of Kiesenwetter's papers. [*See* Rec., 2157.] *G: D.* (3166)

Kirschbaum, Carl Ludwig. [Biog. notice]. (Entom. mo. mag., July 1880, v. 17, p. 47.]

[*See* Rec., 2158.] *G: D.* (3167)

Mulsant, Étienne, biog. sketch of.

FELISSIS-ROLLIN, J. Notice nécrologique sur Étienne Mulsant. (Ann. soc. entom. Fr., 1880, s. 5, v. 10, p. 403-412.)

LOCARD, A. Étienne Mulsant, sa vie et ses œuvres. Notice biographique. Avec portrait. Lyon, 1882. (55 p.) 8°.—*Zool. anzeiger*, 19 June 1882, jahrg. 5, p. 294.

B. 2 March 1797, at Marnand, canton of Thizy, near Villefranche, dept. Rhône, France; d. 2 Nov. 1880, at Lyons, France. [*See* Rec., 2161.] *G: D.* (3168)

[**Ougspurger**, Philibert Friedrich, biog. notice of.] (Psyche, March 1881, v. 3, p. 191.)

[*See* Rec., 2162.] *G: D.* (3169)

Snellen van Vollenhoven, S: Constant, biog. sketch of.

DOHRN, Carl Anton. Snellen van Vollenhoven, ein gedenkblättchen. (Entom. zeitung. . . . Stettin, 1881, p. 371-375.)

[*See* Rec., 2165.] *G: D.* (3170)

NECROLOGY FOR 1881.

ADDITIONAL TO REC., 2656-2672.

[**Blackburn**, J: Bickerton, biog. notice of.] (Entom. mo. mag., Dec. 1881, v. 18, p. 164.)

C[ARRINGTON], J: T. John Bickerton Blackburn. (Entomologist. Dec. 1881, v. 14, p. 301-302.)

[*See* Rec., 2657.] *G: D.* (3171)

[**Blackwall**, J:, biog. notice of.] (Entom. mo. mag. July 1881, v. 18, p. 45.)

CAMBRIDGE, Octavius Pickard. John Blackwall, obituary notice. (Entomologist, July 1881, v. 14, p. 145-150.)

Born 20 Jan. 1789, at Crumpsall Old Hall, near Manchester, England; d. 11 May 1881, at Llanwrst, Wales. [*See* Rec., 2656.] *G: D.* (3172)

DE **Chaudoir**, Maximilien, biog. sketch of.

SALLÉ, Auguste. Notice nécrologique sur le baron Maximilien de Chaudoir. (Ann. soc. entom. Fr., 1881, s. 6, v. 1, p. 181-188.)

Baron de Chaudoir was b. 12 Sept. 1816, at Iwnitza, near Jitomi, in Wolhynia; d. 6 May 1881, at Amélie-les-Bains, Pyrénées-Orientales, France. Sallé gives a list of Chaudoir's entomological papers. [*See* Rec., 2658.] *G: D.* (3173)

[**Garneys**, W:, biog. notice of.] (Entom. mo. mag., 1881, v. 18: Nov., p. 144; Dec., p. 163-164.)

CARRINGTON, J: T. William Garneys. (Entomologist, Dec. 1882, v. 14, p. 302.)

[*See* Rec., 2660.] *G: D.* (3174)

[**Giebel**, Christoph Gottfried Andreas, biog. notices of.] (Amer. nat., Feb. 1882, v. 16, p. 174.) (Entom. mo. mag., Feb. 1882, v. 18, p. 215.) (Zeitschr. f. d. ges. naturw., Nov.-Dec. 1882, bd. 54, p. 613-637.)

[*See* Rec., 2661.] *G: D.* (3175)

[**Gray**, J:, biog. notice of.] (Entom. mo. mag., Jan. 1882, v. 18, p. 190-191.)

Entomologist, d. 27 Nov. 1881, at Claygate, Esther, England, aged 69 years. *G: D.* (3176)

[**Hensel**, Reinhold, biog. notice of.] (Zool. anzeiger, 14 Nov. 1881, jahrg. 4, p. 604.) (Naturae novitates, Nov. 1881, no. 23, p. 192.)

Once professor in the agricultural academy in Proskau, Silesia; d. 5. Nov. 1881, in Oppeln, Silesia. *G: D.* (3177)

[**Koch**, Gabriel, biog. notice of.] (Entom. mo. mag., March 1881, v. 17, p. 240.)

[*See* Rec., 2665.] *B: P. M.* (3178)

[**Mniszech**, Georges Vandalia, biog. notice of.] (Amer. nat., Jan. 1882, v. 16, p. 65.) (Zool. anzeiger, 20 March 1882, jahrg. 5, p. 148.)

Coleopterist, d. 17 Nov. 1881, in Paris, France. *G: D.* (3179)

[**Putnam**, Joseph Duncan, biog. notice of.] (Amer. nat., Jan. 1882, v. 16, p. 65.)

[*See* Rec., 2666.] *G: D.* (3180)

Rolleston, G:, biog. notice of.

F[LOWER], W[:] H[:]. George Rolleston. (Proc. roy. soc. Lond., Dec. 1881, v. 33, p. 24-27.)

Prof. Rolleston was b. at Maltby, England, 30 July 1829; d. 1881. *G: D.* (3181)

Rosenhauer, Wilhelm Gottlieb, biog. notice of.

DOHRN, Carl Anton. Wilhelm Gottlieb Rosenhauer. (Entom. zeitung . . . Stettin, 1881, jahrg. 42, p. 488.)

[*See* Rec., 2668.] *G: D.* (3182)

Rothenbach, Johann Christian, biog. notice of.

JAEGGI, F. Nachruf. (Mitth. schw. entom. ges., Nov. 1881 [Jan. 1882], v. 6, p. 243-250.)

Entomologist; b. 6 Dec. 1796, in Alsatia; d. 9 Sept. 1881, in Aarberg, Switzerland. *G: D.* (3183)

DE **Rougement**, Philippe, biog. notices of.

TRIBOLET, ———. Philippe de Rougement. Notice biographique. (Mitth. schw. entom. ges., Feb. [May] 1882, v. 6, p. 257-261.)

TRIBOLET, ———. Philippe de Rougement. Notice biographique. (Neuchatel), 1882. (15 p.) 8°.—*Zool. anzeiger*, 19 June 1882, jahrg. 5, p. 294.

Prof. de Rougement was b. at St. Aubin, Switzerland, 17 April 1850; d. in Neuchatel, 27 May 1881. Tribolet's notice gives a list of de Rougement's papers. *G: D.* (3184)

[**Whitman**, Allen, biog. notice of.] (Boston [Mass.] d. advertiser, 14 Nov. 1881, no. 22843, v. 138, no. 115, p. 2, col. 2, 5 cm.] (Amer. nat., Jan. 1882, v. 16, p. 86.)

B. in East Bridgewater, Mass., in 1836; d. Nov. 1881, in St. Paul, Minn. *G: D.* (3185)

[**Zaddach**, Ernst Gustav, biog. notices of.] (Naturae novitates, June 1881, no. 12, p. 104.) (Zool. anzeiger, 11 July 1881, jahrg. 4, p. 364.) (Entom. nachrichten, 1 Aug. 1881, jahrg. 7, p. 232.) (Psyche, July-Sept. 1881 [March 1882], v. 3, p. 259.)

ALBRECHT, P. Prof. Dr. G. Zaddach. Gedächtnisrede geh. in d. phys.-ökon. ges. Königsberg. (10 p.)—Aus: Schrift. d. phys.-ökon. ges. Königsberg, jahrg. 22, p. 119-128.—*Zool. anzeiger*, 19 June 1882, jahrg. 5, p. 294.

Professor of zoology in Königsberg, Prussia; b. 7 June 1817, in Dantzig, Prussia; d. 5 June 1881, in Königsberg. *G: D.* (3186)

NECROLOGY FOR 1882.

[**Balfour**, Francis Maitland, biog. notices of.] (Athenaeum, 29 July 1882, p. 148, col. 1, 20 cm.) (Zool. anzeiger, 14 Aug. 1882, jahrg. 5, p. 436.) (Naturae novitates, Aug. 1882, no. 16, p. 152.) (Amer. nat., Oct. 1882, v. 16, p. 843.) (Kosmos, 1882, jahrg. 6, bd. 12, p. 39-42.) (Arch. f. mikros. anat., 1882, bd. 21, p. 828-835.)

FOSTER, Michael. Francis Maitland Balfour. (Nature, 3 Aug. 1882, v. 26, p. 313-314.)

GRIFFITH, G. Francis Maitland Balfour. (Nature, 17 Aug. 1882, v. 26, p. 365.)

GAMGEE, Arthur. The researches of Francis Maitland Balfour. (Nature, 24 Aug. 1882, v. 26, p. 406-407.)

F. M. Balfour, professor of animal morphology at Cambridge, England, was killed by a fall on the south side of Mont Blanc, 19 July 1882; age 30 or 31 years. *G. D.* (3187)

[**Belfrage**, Gustaf Wilhelm, biog. notice of.] (Nature, 22 Feb. 1883, v. 27, p. 399.)

Swedish entomologist; d. 7 Dec. 1882, at Clifton, Bosque Co., Texas, where he had resided for several years. *G. D.* (3188)

[**Cornalia**, Emilio, biog. notices of.] (Zool. anzeiger, 19 June 1882, jahrg. 5, p. 316.) (Naturae novitates, July 1882, no. 13, p. 128.)

Professor Cornalia, director of the Museo civico in Milan, was b. in 1825; d. 8 June 1882. *G. D.* (3189)

[**Darwin**, C: Robert, biog. notices of.] (Athenaeum, 29 April 1882, p. 541-542, 70 cm.; 13 May 1882, p. 604-605, 50 cm. [latter notice includes a list of papers relating to Darwin and Darwinism in periodicals of England and America].) (Sci. american, 29 April 1882, v. 46, p. 256, col. 2, 27 cm.) (Ann. and mag. nat. hist., May 1882, s. 5, v. 9, p. 402-404.) (Naturae novitates, May 1882, no. 9, p. 95.) (Nature, 1882, v. 26: 18 May, p. 49-51; 25 May, p. 73-75; 1 June p. 97-100; 15 June, p. 145-147; 22 June, p. 169-171.) (Amer. nat., June 1882, v. 16, p. 487-490.)

ALLEN, Grant. Obituary. Charles Darwin. (Academy, 29 April 1882, v. 21, p. 306-307, 77 cm.)

C[ARRINGTON], J: T. Charles Robert Darwin. Obituary notice. (Entomologist, May 1882, v. 15, p. 97-102.)

E[DWARDS], H: Obituary. Charles Robert Darwin. (Papilio, May 1882, v. 2, p. 81.)

GRAY, Asa. Charles Darwin. Biographical notice. (Amer. journ. sci. and arts, 1882, s. 3, v. 24, p. 453-463 ["From Proc. amer. acad. arts and sci., v. 17"].)

[**Darwin**, C: Robert, biog. notices of.]

HUXLEY, T: H: Charles Darwin. (Nature, 27 April 1882, v. 25, p. 597.)

QUATREFAGES, A. (Comptes rendus acad. sci. France, 1 May 1882, v. 94, p. 1216-1222.) Eng. tr. (Ann. and mag. nat. hist., June 1882, s. 5, v. 9, p. 467-474.)

The following notices are compiled from the *Zoologischer anzeiger*.

ANON. (Ibis, 1882, s. 4, v. 6, p. 479-484.)

BACON, G. W., *comp.* Life of Charles Darwin. With British opinion on evolution. London, *Bacon*, 1882. 52 p., 8°. 1s.

DE CANDOLLE, Alphonse. Darwin, considéré au point de vue des causes de son succès et de l'importance de ses travaux. (Arch. sci. phys. et nat., Genève, May 1882, s. 3, v. 7, p. 481-495.)

CARUS, Julius Victor. Charles Robert Darwin. (Unsere zeit, 1882, p. 200-226.)

CHUN, Carl. Charles Darwin [with portr.]. (Humboldt, 1882, jahrg. 1, p. 279-284.)

FOURNIÉ, Édouard. Charles Darwin, étude critique. Paris, *impr. Chaix*, 1882. 20 p., 8°. [Extr. de la Revue médic. franç. et étrang.]

HUXLEY, T: H:, G. J. ROMANES, Archibald GEIKIE and W. T. T. DYER. Memorial notices of Charles Darwin [with portr.]. Lond., 1882. [Reprinted from Nature.] 8°.

LE ROY, J. J. Charles Darwin. Eene levensschets. [Tweede, met een levensbericht van Darwin vermeerderde uitgave van "Bondige uiteenzetting van het Darwinisme."] Deventer, *W. Hulscher* GJzn, 1882. 172 p., 8°. fl. 1.65.

MAGGIORANI, C. Commemorazione di Carlo Darwin. (Atti real. accad. Lincei, Transunti, 1882, s. 3, v. 6, p. 217-219.)

MANTEGAZZA, P. Commemorazione di Carlo Darwin. Pisa, 1882. 16°.

MOLESCHOTT, J. Charles Darwin. Denkrede. Giessen, 1882. 8°.

PROOST, M. A. Darwin et les progrès de la zoologie. Bruxelles, 1882. 69 p., 8°.

RAUWENHOFF, N. W. P. Charles Robert Darwin. Rede bij de opening der 109de algemeene vergadering van het Provinciaal Utrechtsch genootschap van kunsten en wetenschapen to Utrecht den 27 Juni 1882, uitgesproken. Utrecht, *L. E. Bosch & Zorn*. 1882. 29 p., 8°.

SCHAAFFHAUSEN, H. Charles Robert Darwin. Ein nachruf. [no imprint, no date.] [1882!]

SICARD, Henri. Charles Darwin. Lyon, *impr. Giraud*, 1882. 8 p., 8°. [Extr. du Lyon médical, 7 May 1882.]

[**Darwin**, C: Robert. Biog. notices of.]
THOMSON, G: M. Charles Darwin. (New Zeal. journ. sci., 1882, v. 1, p. 133-136.)
TOMMASI, S. Carlo Darwin. Napoli, 1882. 11 p., 8°.
WILLIAMS, S. Fletcher. Darwin and Darwinism. ([Yorkshire] Naturalist, 1882, v. 8: Sept., p. 17-24; Oct., p. 36-43.)
ZACHARIAS, O. Charles R. Darwin und die culturhistorische bedeutung seiner theorie vom ursprung der arten. Mit bildn. Berlin, *E. Staude*, 1882. 83 p., 8°. M. 1.20.

Darwin, naturalist and originator of the "Darwinian" theory of the origin of species, was b. in Shrewsbury, England, 12 Feb. 1809; d. at Down, Beckenham, Kent, England, 19 April 1882. *G: D.* (3190)

[**Gurlt**, Ernst Friedrich, biog. notice of.] (Zool. anzeiger, 23 Oct. 1882, jahrg. 5, p. 556.)

Dr. Gurlt, veterinary pathologist and anatomist, and entomological author, b. 13 Oct. 1794, at Drenkau, near Grüneberg, Germany; d. 15 Aug. 1882, in Berlin, Germany. *G: D.* (3191)

[**Hey**, W:, biog. notice of.] (Entom. mo. mag., Jan. 1883, v. 19, p. 192.)
C[ARRINGTON], J: T. Obituary. William Hey. (Entomologist, Dec. 1882, v. 15, p. 287-288.)

Archdeacon Hey, coleopterist, was b. at Ockbrook, Derbyshire, England; d. 22 Nov. 1882, at York, England, in the 72nd year of his age. *G: D.* (3192)

Jobson, J. W., biog. notice of.
C[ARRINGTON], J: T. J. W. Jobson. (Entomologist, March 1882, v. 15, p. 71.)

Entomological collector; d. in Leyton, England, 10 Feb. 1882. *G: D.* (3193)

[**Labrey**, Beebee Bowman, biog. notice of.] (Entom. mo. mag., June 1882, v. 19, p. 22.)
F., J. Beebee Bowman Labrey. (Entomologist, June 1882, v. 15, p. 141-142.)

B. 30 June 1817, in Liverpool, England; d. 26 April 1882, at Disley, Cheshire, England; prepared a work illustrating the plumules of some families of butterflies. *G: D.* (3194)

[**Malm**, August Wilhelm, biog. notice of.] (Naturae novitates, March 1882, no. 6, p. 64.) (Zool. anzeiger, 19 June 1882, jahrg. 5, p. 316.)
SPANGBERG, Jacob. August Wilhelm Malm. (Entom. tids., 1882, arg. 3, p. 157-159; Résumé, p. 161-162.)

Professor Malm, zoologist and director of the Göteborg natural history museum, was b. in 1821; d. 4 March 1882, in Göteborg, Sweden. *G: D.* (3195)

Moss, H:, biog. notice of.
C[ARRINGTON], J: T. Henry Moss. (Entomologist, May 1882, v. 15, p. 119.)

Mr. Moss, lepidopterist, d. at Oldham, England, 17 April 1882, at the age of 64 years. *G: D.* (3196)

[**Norman**, G:, biog. notice of.] (Entom. mo. mag., Sept. 1882, v. 19, p. 96.)

Lepidopterist and hemipterist; b. 1 Jan. 1824, in Hull, England; d. 5 July 1882, in Peebles, England. *G: D.* (3197)

[**Pritchard**, Andrew, biog. notices of.] (Academy, 2 Dec. 1882, v. 22, p. 401, col. 1, 4 cm.) (Athenaeum, 2 Dec. 1882, p. 740. col. 1, 2 cm.) (Naturae novitates, Dec. 1882, no. 24, p. 227.) (Zool. anzeiger, 5 Feb. 1883, jahrg. 6, p. 80.) (Amer. nat., Feb. 1883, v. 17, p. 231-232.)

Microscopist and author upon infusoria and insects; b. in 1804; d. in London, England, 24 Nov. 1882. *G: D.* (3198)

[**Putzeys**, Jules, biog. notices of.] (Entom. mo. mag., Feb. 1882, v. 18, p. 215-216.) (Naturae novitates, Feb. 1882, no. 3, p. 31.) (Zool. anzeiger, 20 March 1882, jahrg. 5, p. 148.) (Amer. nat., April 1882, v. 16, p. 330.)

Coleopterist; d. 2 Jan. 1882, in Brussels, Belgium, in the 73rd year of his age. *G: D.* (3199)

[**Reinhardt**, Johann Th., biog notices of.] (Zool. anzeiger, 27 Nov. 1882, jahrg. 5, p. 644.) (Naturae novitates, Nov. 1882, no. 22, p. 208.) (Amer. nat., Jan. 1883, v. 17, p. 116.)

Dr. Reinhardt, professor and inspector in the museum of natural history in Copenhagen, d. 23 Oct. 1882, aged 66. *G: D.* (3200)

[**Schmidt**, Franz, biog. notices of.] (Zool. anzeiger, 10 July 1882, jahrg. 5, p. 364.) (Naturae novitates, July 1882, no. 15, p. 144.)

Dr. Schmidt, lepidopterist, d. 15 June 1882, in Wismar, Germany. *G: D.* (3201)

[**Schmidt-Göbel**, Hermann Max, biog. notices of.] (Zool. anzeiger, 23 Oct. 1882, jahrg. 5, p. 556.) (Naturae novitates, Oct. 1882, no. 21, p. 200.)

Dr. Schmidt-Göbel, coleopterist and economic entomologist, d. 17 Aug. 1882, at Klosterneuberg, near Vienna, Austria, aged 73. *G: D.* (3202)

[**Siewers**, C: Godfrey, biog. notices of.] (Cincinnati [Ohio] commercial, 8 Sept. 1882, p. 4, col. 8, 18 cm.; p. 5, col. 4, 1 cm.) (Papilio, Oct. 1882, v. 2, p. 145.) (Psyche, June [13 Oct.] 1882, v. 3, p. 359-360.)
DURY, C: Obituary. (Can. entom., Sept. 1882, v. 14, p. 176.)

Entomologist; b. 24 May 1815, on the island of Santa Cruz, in the West Indies; d. 6 Sept. 1882, at Newport, Ky. *G: D.* (3203)

[**Sinclair**, Robert W., biog. notice of.]

C[ARRINGTON], J: T. Obituary. Robert W. Sinclair. (Entomologist, March 1882, v. 15, p. 71.)

Entomologist; d. in Dublin, Ireland, 28 Jan. 1882, aged 22 years. *G: D.* (3204)

[**Tarriel**, Ernest, biog. notice of.] (Feuille d. jeunes naturalistes, April 1882, ann. 12, p. 75.)

Entomologist; d. at Rouen, France, in 1882, in the 21st year of his age. *G: D.* (3205)

[**Thompson**, C: Wyville, biog. notice of.] (Naturae novitates, March 1882, no. 6, p. 64.) (Entom. mo. mag., April 1882, v. 18, p. 264.) (Amer. nat., May 1882, v. 16, p. 435.)

MOSELEY, H. N. Obituary. Sir Charles Wyville Thompson. (Academy, 18 March 1882, v. 21, p. 196, col. 1-2, 39 cm.)

In early life a collector of lepidoptera, later a general zoologist; b. in Boynside, Linlithgow, Scotland; d. 10 March 1882, in London, England, aged 52 years. *G: D.* (3206)

[**Thwaites**, G. H. K., biog. notices of.] (Athenaeum, 14 Oct. 1882, p. 500, col. 1-2, 8 cm.) (Naturae novitates, Oct. 1882, no. 21, p. 200.) (Entom. mo. mag., Nov. 1882, v. 19, p. 142.)

For a long time director of the botanical garden at Peradeniya, Ceylon; entomologist; d. 11 Sept. 1882, in Kandy, Ceylon, in his 72nd year. *G: D.* (3207)

[DE **Tinseau**, Robert, biog. notice of.] (Feuille d. jeunes naturalistes, April 1882, ann. 12, p. 75.)

Coleopterist; d. at Hyères, France, 13 March 1882. *G: D.* (3208)

[**Troschel**, Franz Hermann, biog. notices of.] (Zool. anzeiger, 27 Nov. 1882, jahrg. 5, p. 644.) (Naturae novitates, Nov. 1882. no. 23, p. 216.) (Amer. nat., Jan. 1883, 2, 17, p. 116.) v.

Professor of zoology at Bonn, Germany, founder of the "Archiv für naturgeschichte"; b. at Spandau, Germany, 10 Oct. 1810; d. in Bonn, 6 [? 4] Nov. 1882. *G: D.* (3209)

Wales, G:, biog. notice of.

STAINTON, H: Tibbats. George Wales. (Entom. mo. mag., Feb. 1883, v. 19, p. 211-212.)

Lepidopterist; d. at Gateshead, Durham Co., England, 30 Oct. 1882, in the 80th year of his age. *G: D.* (3210)

[**Westring**, Niklas, biog. notices of.] (Zool. anzeiger, 23 Oct. 1882, jahrg. 5, p. 556.) (Naturae novitates, Oct. 1882, no. 20, p. 192.)

SANDAHL, Oskar Th. Niklas Westring. (Entom. Tids., 1882, arg. 3, p. 9-12; Résumé, p. 99.)

Entomologist, especially arachnologist; b. 13 Nov. 1797, in Göteborg, Sweden; d. 28 Jan 1882, in Göteborg. *G: D.* (3211)

BIBLIOGRAPHICAL RECORD.

Coquillett, Daniel W: Notes and descriptions of a few lepidopterous larvae. (Papilio, 26 April 1881, v. 1, p. 56-57.)

Describes larvae of *chamyris cerintha*, *apatela brumosa*, *heliothis luteitinctus*, *scoliopteryx libatrix*, *catocala coccinata*, *caterva catenaria* and *eupithecia interruptofasciata*. *H: E.* (3212)

Crotch, G: Robert. On the arrangement of the families of coleoptera. (Proc. Amer. philos. soc. Phila., 7 Feb. 1873, v. 13, p. 75-87.)

Coleoptera divided into *rhynchophora* and *coleoptera genuina;* the latter subdivided into *heteromera* and *isomera* on tarsal and antennal characters. *H: W. T.* (3213)

Edwards, W: H: Description of new species of butterflies. Chiefly collected by Mr. Morrison in 1880. (Papilio, 26 April 1881, v. 1, p. 43-48.)

Describes as new *anthocaris morrisoni* from California; and *melitaea perdiccas*, *m. colon*, *pyrgus philetas*, *copaeodes eunus*, *pamphila siris*, *p. mardon*, all from Oregon. *H: E.* (3214)

Edwards, H: Descriptions of new species and varieties of *arctiidae*. (Papilio, 10 March 1881, v. 1, p. 38-39.)

Describes as new *euprepia opulenta*, *arctia incorrupta*, *a. achaia* var. *barda*, *antarctia punctata* var. *proba*, *halesidota ingens*, all from Pacific states. *H: E.* (3215)

Edwards, H: Notes on the Pacific coast species of *hepialus* with descriptions of new forms. (Papilio, 10 March 1881, v. 1, p. 35-36.)

Describes as new *hepialus rectus*, *h. anceps*, *h. inutilis;* suggests that many so-called Californian species are but variations from one type. *H: E.* (3216)

Edwards, H: Notes on the Pacific coast species of *orgyia*, with descriptions of larvae and new forms. (Papilio, 26 April 1881, v. 1, p. 60-62.)

Describes as new *orgyia gulosa* and *o. cana;* describes larvae of *o. vetusta* and *o. gulosa;* contends for the difference of these species, which have previously been confounded; suggests that *o. badia* H: Edw. and *o. nova* Fitch. = *o. antiqua* Linn. *H: E.* (3217)

Edwards, H: On some apparently new forms of diurnal lepidoptera. (Papilio, 26 April 1881, v. 1, p. 50-55.)

Describes as new *anthocaris coloradensis*, *coenonympha californica* var. *pulla*, *melitaea dzwinellei*, *m. baroni*, *m. rubicunda*, *m. anicia* var. *wheeleri*, *thecla citima*, *th. spadix*, *th. nelsoni* var. *exoleta*, *th. muiri*, *th. irus* var. *mossii*, *th. tacita*, *lycaena speciosa* ♀; the male of *l. speciosa* previously described suggests that *melitaea baroni* and *m. rubicunda* are probably varieties of *m. quino* Behr. *H: E.* (3218)

Fernald, C: H: Notes on Fitch's species of tortricids. (Papilio, 10 March 1881, v. 1, p. 36-37.)

Notices some errors in Fitch's descriptions of moths in his reports as state entomologist of New York; refers *croesia persicana* to the genus *ptycholoma*, *lozotaenia cerasivorana* to *cacoecia*, and *argyrolepia quercifoliana* to *tortrix*; correct error of Miss E. A. Smith in 7th rept. of state entomologist of Illinois, concerning *tortrix flaccidana*. *H: E.* (3219)

French, G: Hazen. Notes on *catocala sappho* Strecker. (Papilio, 26 April 1881, v. 1, p. 57.)

Gives reason for considering *catocala sappho* as a distinct species, and announces its capture in Texas, Georgia and Illinois. *H: E.* (3220)

Grote, A: Radcliffe. A *choreutes* on *silphium integrifolium*. (Papilio, 10 March 1881, v. 1, p. 40.)

Describes as new *choreutes silphiella*, found by D. W. Coquillett in Illinois. Gives description also of the larva (quoting Coquillett), which forms its nest by fastening the terminal leaves together. *H: E.* (3221)

Grote, A: Radcliffe. Descriptions of *geometridae*, chiefly collected by Mr. Pilate. (Papilio, 10 March 1881, v. 1, p. 40-42.)

Describes as new *plagodis floscularia*, *aspilates gausaparia*, *deilinia glomeraria*, and *d. septemfluaria*, all from Ohio. *H: E.* (3222)

Grote, A: Radcliffe. New noctuidae from Washington Territory. (Papilio, 26 April 1881, v. 1, p. 58-59.)

Describes as new *mamestra liquida*, *valeria conserta*, *hadena semilunata*. Compares *m. liquida* with *m. lilacina* and *m. legitima*, and *h. semilunata* with *h. inordinata*. *H: E.* (3223)

Grote, A: Radcliffe. New noctuids, with a list of the species of *oncocnemis*. (Papilio, 10 March 1881, v. 1, p. 33-35.)

Describes as new: *oncocnemis major*, *o. aqualis*, *hadena cymosa*, *deva palligera*. Compares *o. major* and *o. aqualis* with *o. chandleri*, compares *h. cymosa* with *h. arctica* and *d. palligera* with *d. purpurigera*. Gives a list of the 18 North American species of *oncocnemis*. *H: E.* (3224)

Grote, A: Radcliffe. New species of *dicopis*, *chytonix* and *spragueia*. (Papilio, 26 April 1881, v. 1, p. 48-50.)

Describes as new *dicopis depilis* from Ohio, *chytonix sensilis* from Massachusetts, and *spragueia pardalis* from Florida. *H: E.* (3225)

Hagen, Hermann August. *Papilio ecclipsis*, a doubtful or lost N. American butterfly. (Papilio, 10 March 1881, v. 1, p. 42.)

Rev., by A. G. Butler, entitled "On *papilio ecclipsis*, Linn." (*op. cit.*, 26 Apr. 1881, p. 59.)

Calls attention to an insect figured under the above name by Petiver in his Gazophylacium, pl. 10, fig. 6, and asks for information on the subject. *H: E.* (3226)

Maus, W. Hermaphroditen von *saturnia pavonia* L.: *carpini* S. V. (Entom. nachrichten, 15 Dec. 1881, jahrg. 7, p. 355-356.)

Notes on hemaphrodites of *s. pavonia*. *G: D.* (3227)

Neumoegen, Berthold Description of a remarkable new geometrid. (Papilio, Sept. 1881, v. 1, p. 145-146.)

Describes *aspilates viridirufaria* from southern Colorado. *H: E.* (3228)

Neumoegen, Berthold. A little beauty from northern Arizona. (Papilio, Oct. 1881, v. 1, p. 149.)

Describes *sphinx* (*hyloicus*) *dollii*, a new species allied to *s. sequoiae* Boisd. *H: E.* (3229)

Schneider, Friedrich Emil Robert. Die schuppen an den verschiedenen flügel- und körpertheilen der lepidopteren. Dissertatio inauguralis zoologica . . . in Academia Fredericiana Halensi cum Vitebergensi consociata ad summos in philosophia honores rite impetrandos . . . . [Separat-abdruck aus der Zeitschrift für die gesammten naturwissenschaften, 1878, reihe 3, bd. 3, s. 1-59, taf. 1-3.] Halis Saxonum, 1878. t.-p. cover, [4+] 59 [+1] p., 22×14, t 17×9.7: 3 pl.

Notice. (Bericht . . . der entomologie, 1877-1878, p. 424-425.)

Discusses the form and size of the scales on different parts of lepidoptera. *G: D.* (3230)

Schroeder, G. Merkwürdige abnormität. (Entom. nachrichten, 1 May 1880, jahrg. 6, p. 94.)

Leistus rufomarginatus with a four-jointed branch on one antenna. *G: D.* (3231)

Williston, S: Wendell. [*Eristalis tenax*.] (Can. entom., Aug. 1881, v. 13, p. 176.)

Occurrence of *eristalis tenax* in New Haven [Conn.], Wash. Terr., and Kan. *A. K. D.* (3232)

Williston, S: Wendell. The North American species of *conops*. (Trans. Conn. acad., March. 1882, v. 4, p. 325-342.)

Account of all the (15 recognizable and 6 irrecognizable) N. A. species of *conops*, describing 7 new species; remarks on the specific characters; synoptical table of the American genera of *conopidae* and of 14 N. A. species of *conops*. *B: P. M.* (3233)

Worthington, C: Ellis. Differences without distinctions. (Can. entom., June 1881, v. 13, p. 123-126.)

Discusses the confusion which exists in the designation of varieties of insects; proposes to classify actual varieties as seasonal, climatic, dimorphic, occasional and melanic or albinic. *G: D.* (3234)

ENTOMOLOGICAL ITEMS.

ACCORDING TO the daily press, buffalo gnats [*Similium* sp.] are doing great damage to live stock in Desha and Chicol counties, Arkansas.

THE BUFFALO society of natural sciences has had a bequest from Dr. Hayes, said to amount to $150,000, which is not, however, available at present.

PROF. J. T. REINHARDT, who died 23 Oct. 1882, is succeeded, in his place as inspector of the zoological museum in Copenhagen, by Dr. Christian Lütken.

THE FRENCH association for the advancement of the sciences will hold its annual congress, 16 August, this year, at Rouen. The section of zoology will be presided over by Dr. Jousset de Bellesme.

BENJAMIN COOKE, for several years President of the Northern entomological society and later Vice President of the Lancashire and Cheshire entomological society, died at Southport, England, 4 Feb. 1883, aged 66 years.

COUNT H. ZU SOLMS-LAUBACH has lately published a pamphlet on the origin, domestication and cultivation of the fig-tree, which contains much of interest on the subject of caprification. An abstract of the pamphlet is given in *New Remedies* for April 1883.

REV. HENRY C. McCOOK, of Philadelphia, is engaged upon an illustrated book on "American spiders and their spinning work," and hopes to have a volume on the "Industry and habits of orbweavers" ready by midsummer. — *Science*, 23 March 1883, v. 1, p. 207.

THE PAPER by Prof. F. H. Snow in PSYCHE (vol. 3, no. 98) on *Trogoderma tarsale* is noticed in the *American naturalist* for Feb. 1883 (p. 199), where it is stated that this species is "the most common museum pest in this country," and that it is by far the most dangerous enemy to collections of insects in Washington, D. C.

EMBRYOLOGY OF THE SILK-WORM. — This has been studied by S. Salvatico, who finds that the amnion appears as a membrane with large nucleated cells like those of the serous membrane, but without pigment. The malpighian vessels originate in the ectoderm. He did not note the early appearance of the rudiments of the genital glands, which was observed by Balbiani in *Tinea crinella*.— *Amer. nat.*, April 1883, v. 17, p. 444.

PROF. XAVER LANDERER writes, in the *Deutsch-Amerikanische Apotheker-Zeitung* for 1 March 1883, that "the largest and heaviest grasshoppers are sought out in Arabia, Egypt, etc. The wings, feet, heads, etc. are torn off and the remaining fleshy part put in vinegar and used as pickles. In Abyssinia I had such sour grasshoppers prepared with aromatic herbs, set before me, and they tasted finely and would be eaten with appetite by all who did not know what they really had before them."

PROF. F. W. MAEKLIN died January 8th of this year at Helsingfors, Finland, at the age of 61 years. He was known to American coleopterists by his papers on *Strongylium* and *Statira*, and by his descriptions of a large number of coleoptera (mostly *Staphylinidae*) from the extreme north-western portions of our country. One of his earlier and little known papers, a dissertation on representative (vikarierande) forms among northern coleoptera (published in the Swedish language, Helsingfors, 1855) is quite interesting to American coleopterists, and was translated into German by F. von Sacken in the Stettiner Entomologische Zeitung for 1857.— *Amer. naturalist*, April 1883, v. 17, p. 424.

WE ARE indebted to Mr. G. Barricelli, of Holden, Mo., for several numeros of his "Silk-culture directory," and for two nos. of the "American silk and fruit culturist" containing articles by him. Mr. Barricelli evidently has a good practical knowledge of silk-raising, notwithstanding some of the curious statements, from a purely scientific standpoint, made in his papers. His "Silk-

culture directory" is still more curious from a typographical and literary standpoint. Altho we think silk-raising will not become a great industry in this country for years, on account of the high price of labor, yet agitation in the interest of silkworm-raising may do good. In families comprising a number of otherwise unemployed persons the small profits to be derived from the rearing of a few thousand silk-worms may be worth the labor.

THE *Deutsch-Amerikanische Apotheker-Zeitung*, for 1 March 1883, gives M. Serpin's mode of making insect powder from tar. "The process depends upon converting gas-tar from fluid into solid condition, but taking care that the tar retains all the efficacious properties which it had in liquid form. The conversion is brought about by careful heating of the tar over a moderate coke or coal fire to 20°–40° C. A proper quantity of lime or finely powdered gypsum is mixed with it. A pulverisable mass is now obtained, which is rubbed through a sieve, and after completely cooling, the powder is mixed with ammonic sulphate, ferrous sulphate, bits of glass, and sodic sulphate, all in pulverized condition."

SOCIETY MEETINGS.

THE REGULAR meetings of the Cambridge Entomological Club will be held at 7.45 p. m., on the days following:—

13 Oct. 1882.	9 Mar. 1883.
10 Nov. "	13 Apr. "
8 Dec. "	11 May "
12 Jan. 1883.	8 June "
9 Feb. "	

G. DIMMOCK, *Secretary*.

THE NEW YORK Entomological Club meets twice monthly, except in June, July and August, but no special date is fixed for each meeting.

HENRY EDWARDS, *Secretary*.

THE REGULAR meetings of the Entomological Section of the Boston Society of Natural History will be held at N. W. corner of Berkeley and Boylston Sts., Boston, Mass., at 7.45 p. m., on the days following:—

25 Oct. 1882.	28 Feb. 1883.
22 Nov. "	28 Mar. "
27 Dec. "	25 Apr. "
24 Jan. 1883.	23 May "

EDWARD BURGESS, *Secretary*.

THE REGULAR meetings of the Entomological Section of the Academy of Natural Sciences, of Philadelphia, Pa., will be held at S. W. corner of 19th and Race Sts., on the days following:—

14 Oct. 1881.	10 Mar. 1882.
11 Nov. "	14 Apr. "
9 Dec. "	12 May "
13 Jan. 1882.	9 June "
10 Feb. "	

JAMES H. RIDINGS, *Recorder*.

THE SEMI-ANNUAL meetings of the American Entomological Society will be held at S. W. corner of 19th and Race Sts., Philadelphia, Pa., on the days following:—

12 Dec. 1881.	12 June 1882.

JAMES H. RIDINGS, *Recording Secretary*.

THE REGULAR monthly meetings of the Montreal Branch of the Entomological Society of Ontario, will be held at Montreal, Que., Canada, on the days following:—

3 Oct. 1882.	6 Feb. 1883.
7 Nov. "	6 Mar. "
5 Dec. "	3 Apr. "
9 Jan. 1883.	1 May "

G. J. BOWLES, *Secretary*.

THE REGULAR meetings of the Brooklyn Entomological Society will be held at 9 Broadway, Brooklyn, E. D., N. Y., on the days following:—

28 Oct. 1882.	31 Mar. 1883.
25 Nov. "	28 Apr. "
30 Dec. "	26 May "
27 Jan. 1883.	30 June "
24 Feb. "	

F. G. SCHAUPP, *Secretary*.

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[Established in 1874.]

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MAY–JUNE 1883.

CONTENTS:

ADVERTISEMENTS 42
THE SCALES OF COLEOPTERA.—*George Dimmock* 43–47
ON AN EGG-PARASITE OF THE CURRANT SAW-FLY (NEMATUS VENTRICOSUS)—*Joseph Albert Lintner* 48–51
THE TARSAL AND ANTENNAL CHARACTERS OF PSOCIDAE—*Hermann August Hagen* 52
THE CHIGOE IN AFRICA 52
REARING LEPIDOPTERA 53
BOOK NOTICES 53-54
PROCEEDINGS OF SOCIETIES.—Cambridge Entomological Club—Linnean Society of London 54
BIBLIOGRAPHICAL RECORD, no. 3235-3282 55–58
ENTOMOLOGICAL ITEMS—Notices to Entomologists—Society Meetings . . . 59–60

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EARLY STAGES OF BUTTERFLIES WANTED.

The undersigned desires to obtain, by exchange or otherwise, from all parts of the world, eggs, caterpillars and chrysalids of Diurnal Lepidoptera. Dried specimens are preferred, especially of caterpillars which should be prepared by inflation. Correspondence is invited with persons engaged in the study of the early stages of butterflies.

S. H. SCUDDER,
Cambridge, Mass.

COCCIDAE WANTED.

The undersigned is desirous of obtaining, by exchange or otherwise, specimens of as many species of the COCCIDAE as possible, for the purpose of making a study of the North American forms. Those found infesting cultivated plants especially desired. Living specimens preferred when they can be obtained.

J. HENRY COMSTOCK,
Department of Entomology,
The Cornell University,
Ithaca, N. Y.

GALLS AND GALL INSECTS.

The undersigned desires, either by exchange or otherwise, Galls from all parts of the United States. He is especially interested in those made by *Lepidoptera, Coleoptera, Homoptera and Diptera.* Correspondence in reference to Gall growths, or other vegetable abnormities, is invited. CHARLES V. RILEY,
1700 Thirteenth St., N. W.,
Washington, D. C.

TORTRICIDAE WANTED.

I am desirous of obtaining as many North American TORTRICIDAE as possible, for the purpose of studying this family. I shall be glad to name and return any TORTRICIDAE forwarded to me for this purpose, save such as may prove new and desirable to retain for description.

Pack carefully, and direct to
PROF. C. H. FERNALD, Orono, Me.

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PSYCHE.

THE SCALES OF COLEOPTERA.

BY GEORGE DIMMOCK, CAMBRIDGE; MASS.

(*Continued from page 27.*)

The brown scales are lustreless and without cross-bands, while the white scales, as long as they are filled with air, are silvery. This fact and other reasons lead me to believe that the cross-bands are partial separations of the lower lamina of the scale, and are the cause of the silvery lustre of the white scales. I reserve, however, further discussion of the production of silvery surfaces for the last portion of this paper.

To get at the finer structure of these scales transverse sections of some of the brown ones were made; one of these sections is shown in fig. 7, *d*. Altho numerous sections as thin as 0.0025 mm. were examined, I could find no longitudinal canals or passages, but the lower lamina of the scale is somewhat more transparent than the upper lamina; on the latter portion are the longitudinal striae, seen in transverse section in fig. 7, *d*. Sections of the white scales are similar in form, but are so transparent in the fluids in which I was obliged to study them that I could find no air cavities.

Treatment with reagents give positive proof that both the white and brown scales contain air. Alcohol or water rapidly discharges air from cavities within them; glycerin expels it only less rapidly. Scales regain their air readily when dried from water or alcohol. After treatment with any liquid the white scales become very transparent, showing that they contain no coloring matter; when mounted in Canada balsam they are almost invisible.

ELATERIDAE, SPECIES UNDETERMINED.

Fig. 8 represents the scales from an undetermined species of *elateridae*, from Leipzig, Germany. I figure them here because I have found in no other coleoptera scales of similar form. They

Fig. 8. Scales of an undetermined species of *elateridae*: *a*, seen from above; *b*, lateral view. Enlarged 100 diam.

are, however, similar in structure to the brown scales of *Alaus oculatus*, but they have in addition a prolongation of the distal end of the scale into a sort of short filament.

SCALES OF PTINUS ?RUTILUS.

A species of *Ptinus*, probably *P. rutilus*, which was found in great numbers

in a dry-goods store in Leipzig, Germany, furnishes interesting forms of scales. This coleopteron is clothed with brown hairs, one of which is figured (fig. 9, *c*) and among these hairs are scales (fig. 9, *a* and *b*). The relative size of the hairs and scales of this species of *Ptinus* may be seen from fig. 9, where both are drawn enlarged 100 diameters. These scales have from two to seven long apical points, are attached by a little stem at the base, and are 0.06 to 0.09 mm. in length by 0.01 to 0.03 mm. wide. Their color is light brown, which is apparently produced, for the most part, by somewhat irregular longitudinal stripes or thickenings upon the inner surface of the scales. These scales are filled with air.

Fig. 9. Scales and hair of *Ptinus ? rutilus*: *a* and *b*, scales from elytron; *c*, hair from elytron. Enlarged 100 diam.

SCALES OF CLYTUS ROBINIAE.

Nearly all the yellow stripes upon *C. robiniae* owe their entire coloration to the scales with which they are covered. This can be seen best by scraping all the scales from the insect, after which, with the exception of the legs and a few yellow stripes on the elytra, it is black. Most black parts of the insect are, however, improved in depth of color by being clothed with black scales. The yellow stripes upon the thorax are produced entirely by yellow scales which are set upon a black background. The whole richness of coloration of *C. robiniae* is produced by the scales with which it is clothed, as can perhaps be most strikingly illustrated by removing the scales from one half of a specimen and leaving the other half intact. In the same way the ground color of the European *Saperda scalaris* is black, its beautiful coloration being due to a dense coating of scale-like hairs.

Fig. 10. Scale of *Clytus robiniae*. Enlarged 100 diam.

The black or brown scales from the upper surface of the thorax or from the elytra of *C. robiniae* resemble, at first glance, those of *Alaus oculatus*, but upon closer examination they prove to be quite different. Their form is approximately an elongated parallelogram (see fig. 10), with the shank or point of attachment at one of the acute angles. The striae originate at and near the shank and terminate along the opposite end of the scale, thus differing entirely, in this respect, from the scales of *Alaus*.

The scales of *C. robiniae* are 0.15 to 0.18 mm. long by about 0.02 mm. wide. Under the microscope they are dark brown or light yellow, according to whether they are from the black or yellow parts of the insect. Both the yellow

and the brown scales have the same form and structure, and both contain air, as can be readily seen by the action of water upon them. Neither the brown nor the yellow scales can be bleached by chlorin.

Of the numerous scales of *curculionidae*, the family of coleoptera in which the possession of scales may be said to be almost a rule, I have chosen for especial study the

SCALES OF ENTIMUS IMPERIALIS.

This species has the most brilliant, and, in some respects, the most interesting scales and hairs of any coleopteron which I have examined. Nearly its whole surface, above and beneath, is covered with lines or masses of minute

Fig. 11. Scales of *Entimus imperialis:* on *a*, *b* and *c* vertical lines indicate blue, horizontal lines indicate carmine red, and oblique lines yellow; where two kinds of lines cross, one color is tinged with the other; on *d* and *e* the fine lines represent the finer striation of the inner layer of the scales. Enlargement: *a*, *b* and *c*, 100 diam.; *d* and *e*, 300 diam.

scales, glistening by reflected light with the brightest colors, and these colors are heightened by the shining black background which the surface of the insect affords. Hairs and scales cover its legs, and the hairs, as will be seen later, are of the same nature as are the scales.

The form of these appendages is extremely variable. Their greatest width is about 0.06 mm., and from this width gradations may be found down to hairs of a diameter of less than 0.01 mm. The length of such as are typically scales (fig. 11, *a*, *b* and *c*) is 0.15 to 0.18 mm. The hairs attain a length of 1.3 mm.

Both hairs and scales are colored in the same way and with the same colors, chiefly red, blue and yellow, by transmitted light, and green and purple by reflected light. Whatever the color by reflected light, its complementary color appears by transmitted light; predominant is red by transmitted, and green by reflected light. Thus one sees the origin of the green color on the coleopteron itself. Green, yellow, red, blue and purple often appear on a single scale, and these colors change if the light is changed from transmitted to reflected; they are especially brilliant upon a black background. Some scales are of a single color, usually red. On figure 11, *a*, *b* and *c*, I have attempted, as far as is possible without colored figures, to show the distribution of colors in three scales. Even colored figures would have poorly represented some of the brilliant variations which the scales present.

More careful miscroscopical examination sufficed, even with low powers, to show that the scales have the appearance of being filled with pigments, separate colors usually in distinct compartments allotted to them. Sometimes, however, similar colors, like yellow and yellowish red (see basal part of fig. 11, *a*), or like blue and purple, are in the same compartment. Sometimes there is a tinge of color near

the margin of a compartment different from the color of the middle of the compartment, as in the upper part of fig. 11, *b*. The extreme margin of the scales is always transparent and colorless, and sometimes, as if by a flaw, a little transparent spot extends into the colored portion of the scale, as near the base of fig. 11, *c*. At all points along the margin where different compartments meet the marginal transparent portion seems to extend inward, and with higher magnifying powers a very thin, transparent partition can be seen extending between the compartments. This partition is clearly and perhaps too strongly represented on fig. 11, *d* and *e*. If a part of a scale, especially near its base, is broken, two edges can be readily seen, showing the scale to be hollow, and the color sometimes fails near the broken edges. Everything indicates pigment coloration, but experience with the colored scales of *Hoplia* teaches the application of reagents. Treatment with the simplest of all reagents, water, dispels all the illusion in regard to enclosed pigments. Every scale that is not absolutely perfect, becomes, in a few moments, transparent and almost colorless, a slight yellow remaining, the water having entered the cracks and broken places in the scales. Is the pigment dissolved or changed chemically by the water? This is negatived by a few experiments similar to those tried on the scales of *Hoplia*. The scales when redried from volatile liquids regain their original coloration, the same colors and shades in their respective compartments and locations. Chlorin or sulphuric anhydrid (SO_2) fails to bleach the scales; acids and alkalies do not change their colors. Uninjured scales are not penetrated by liquids and remain colored in them. The coloration is surely due, then, to physical causes, that is to some form of interference of light.

The hairs are colored similarly to the scales, although the finer hairs appear to the naked eye, or to a simple lens, as silvery white, even when seen on a black surface. In the hairs the colors often alternate in the same general manner as they do in the scales, but, as is usual in the scales, yellow, or yellowish-red, is generally nearest the basal portion of the hair. The external transparent sheath or wall of the hairs, corresponding, as seen under the microscope, to the transparent margin of the scales, varies much in thickness; in some cases the coloration fills nearly the whole hair, in other cases the channel through the hair is very small and consequently the color line very narrow in the hair. When treated with water or other liquids broken hairs are rendered transparent in the same manner as injured scales.

When filled with water the hairs and scales still show, sometimes quite distinctly, the partitions between their different compartments. In rare cases liquids fail to pass a partition, leaving one part of a scale or hair colored after another part has been rendered transparent. Thus it is evident that, however thin the partitions may be, they are water-tight when uninjured; they are, nevertheless, apparently usually broken through, the scales themselves

being so brittle that few can be removed without breaking. My experiments were all made with scales from a specimen dried at least over ten years; possibly a fresh specimen would have less brittle scales.

Further microscopic examination of narrow scales and hairs reveals a longitudinal striation, the striae of which are from 0.0015 to 0.0020 mm. (or even further) apart. This striation, which for greater distinctness I will call the "coarser striation," is present on hairs, less marked on elongated scales, and not generally observable on broad scales (such as represented in fig. 11, *b*). This coarse striation is visible after the color has been removed from the scales and hairs by reagents. It is easily seen to be external on the cylindrical hairs, extending beyond the colored portion of the hairs.

Still higher magnifying power brings to view a second striation, which I will call the "finer striation." This striation was much more difficult to see than the coarser striation, the striae being very delicate and only 0.0008 to 0.0009 mm. apart. Unlike the coarser striation, the finer striation is more evident on broad scales and least evident or not discernible, at least with the objectives at my command, on narrow scales and on hairs. The finer striation is further unlike the coarser striation in following no definite direction on the scale, sometimes being in one direction in one portion of a scale and in another direction in another part of the same scale. In any single compartment of a scale the direction of the finer striation is approximately the same, sometimes a little curved, resembling, as seen under the microscope, the furrows of the finger-tips. In adjacent compartments of a scale the finer striae are sometimes at right angles to each other, though oftener in the same direction. I have attempted to represent, on fig. 11, *d* and *e*, the finer striation upon two scales, but the striae, although proportionately about the right distance apart, are themselves relatively coarser than in nature. The finer striation may be at right or at oblique angles (probably also parallel) to the coarser striation. The finer striation is most evident in blue or purplish parts of scales, altho it exists in other parts; probably the darker background makes it more plainly visible on blue portions. The finer striae appear to be formed of rows of dots, but my objectives failed to determine this with certainty. The finer striation is invisible on scales treated with liquid reagents to remove the air.

Both finer and coarser striation are found on the under as well as the upper side of the scales. At the edges of the scales the coarser striation curves and appears upon the transparent border of the scales, the finer striation (see fig. 11, *e*) curves to meet the margins of compartments; the coarser striation is evidently an external, longitudinal plication of the scale-membrane, limited in extent by the size of the scale itself, the finer striation is a plication or figuration of the inner side of the scale-membrane, limited in extent by the outline of the compartment to which it belongs.

(*To be continued.*)

ON AN EGG-PARASITE OF THE CURRANT SAW-FLY (*NEMATUS VENTRICOSUS*).

BY JOSEPH ALBERT LINTNER, ALBANY, N. Y.

[Read before the American Association for the Advancement of Science, at its Montreal meeting, 29 August 1882.]

Dr. Asa Fitch, in his 12th Annual report on the insects of New York for the year 1867 (Trans. N. Y. state agric. soc. for 1867, 1868, v. 27), p. 931-932, made the following reference to this insect:

"As none of the foreign accounts which we have seen allude to any parasitic enemy of this currant saw-fly, it seemed quite improbable that it would in this country meet with any such enemy, to lighten from us the task of combatting it and diminishing its devastations. But our valued friend J. A. Lintner, of Schoharie, greets us with the glad tidings that he has discovered we have such a foe to this formidable scourge. An egg parasite of this saw-fly inhabits our state, an exceedingly minute hymenopterous insect, which inserts its eggs into those of the saw-fly, that its young may subsist upon and consume the contents of those eggs. This diminutive little fly has probably existed hitherto upon the eggs of some one of our American saw-flies similar in size to those of the currant saw-fly; and it has now discovered that the eggs of this newly arrived foreigner are equally well adapted to its wants. And so multiplied has this little friend of the gardener become, that in Utica Mr. Lintner finds that among fifty eggs of a saw-fly upon a currant leaf, there will not be more than four or five that will hatch currant worms, all the rest being occupied by the little maggot, the young of this parasite. At Schoharie, also, where the saw-fly has arrived more recently than at Utica, he finds this parasite is now beginning to appear. Everywhere this little creature is no doubt following upon the tracks of the saw-fly, and within a very few years after the one arrives in any place the other will be there also, and will speedily become so multiplied as to quell and extinguish it. This is a most important discovery, and renders it quite probable that in this country this currant worm can never be but a temporary evil. Whenever circumstances favor it and enable it to multiply and become numerous in any section of our country, this little enemy, its mortal foe, will speedily be there to subdue and stamp it down. Thus nicely are the works of nature balanced, and no creature is permitted to usurp a place in her domain which does not belong to it."

The specimens of the parasite obtained by me, at the time referred to in the above notice, were submitted to a friend who had made study of the group to which they belong, who believed them to be an undescribed species, and was only able to give them a doubtful generic reference. They were subsequently destroyed, and from that time until the present year (an interval of fourteen years), although I have con-

tinued to search for them, I have been unable to obtain the species.

Its rediscovery by me the present year, and the determination of the species, lend additional interest to the notes upon it that I made at its first observation, at Utica, N. Y., in June 1866, and I therefore transcribe them from my note-book :—

I had collected a number of currant leaves upon which the currant saw-fly had deposited eggs, and was counting the eggs upon each to obtain the average number per leaf, when I noticed an occasional brown egg among them, appearing somewhat abnormal in shape. On placing them under a lens a resemblance to a pupal form was detected. I at once suspected the presence of the parasite for which we had been hoping. Although there seemed to be but the merest chance of discovering at large an insect so minute as this must necessarily be, I instituted a careful search of the currant bushes in the garden, and in a short time had the great gratification of discovering a minute speck moving among the eggs, which under my lens revealed a form which left scarce room for doubt of its parasitic character. During the day I detected several more of the kind upon the leaves containing egg-deposits, affording strong evidence of their relationship. A few days thereafter (perhaps a week), in a small phial in which I had placed some eggs that I suspected of having been parasitized, I had the delight of seeing several of the familiar forms of my currant-leaf acquaintances, and the ruptured pupa cases from which they had evidently escaped.

The following year (1867) there was a marked diminution in the number of currant-worms observed, and a corresponding increase in parasitized eggs. Many of the leaves had not been visited by the parasite, but of those that gave evidence of such visit, the work of destruction was almost complete, for of several leaves bearing each from thirty to forty eggs, all but five or six were transformed into parasitic pupae.

In June 1868, I was able to make, at Schoharie, N. Y., the following observations upon the oviposition of the parasite within the eggs of the currant saw-fly :—

In a small phial in which had been placed some parasitized eggs of the saw-fly, a male and female parasite had emerged. That I might observe their actions I introduced a piece of currant leaf having upon it some eggs which I had just seen deposited. No evidence was given that the female was aware of the presence of the eggs, but after several minutes traveling around the glass, she moved upon the leaf, and in passing over and beneath it, seemed to meet with them accidentally. She paused, and then began a careful inspection, walking over them several times, and constantly palpating them with her antennae. Then, satisfied with her examination, she attached herself to one of the eggs, appressed the tip of her abdomen to it, and remained in this

position motionless for the space of two-and-a-half minutes, during which time an egg, doubtless, was inserted, although the pocket lens with which the observation was made did not disclose the fact. The motion of her antennae then recommenced, and I expected to see the operation just witnessed repeated upon another egg; but, to my surprise, she merely changed position—again applied the tip of her abdomen to a different part of the same egg, and remained at rest for about the same space of time as before. Three times I witnessed this performance, and it is therefore probable that three parasitic eggs were placed within the one of the currant-fly. Unfortunately an interruption prevented me from noticing if the remaining currant-fly eggs were similarly parasitized, and the number of eggs introduced in each; and much to my regret, the eggs were accidentally destroyed before my observations could be made upon their transmutation into parasitic pupae. The pupa cases are dark brown, disclosing some of the outlines of the contained pupae, somewhat flattened, broader than the original egg, but of about its length. The insect is apparently one of the *chalcididae*, having a broad head, long and elbowed antennae, ovoid anterior wings, nearly veinless, beautifully iridescent, delicately fringed and haired; the posterior wings are almost linear; the abdomen is short, not reaching the tips of the wings.

This year (1868) is probably the first appearance of the parasite at Schoharie, as I could only discover about a dozen individuals. Its progress seems to be from west to east, corresponding with that of the currant-worm.

The rediscovery of the parasite the present year (1882) was made in my garden at Albany, upon a solitary currant bush growing there. The parasitized eggs were enclosed in a bottle, and in a few days the insects emerged. That I might multiply and aid in the distribution of an insect which had already shown its capability for usefulness, I visited another garden in the city to obtain eggs of the currant-fly for parasitization by my confined individuals. To my surprise, the parasite was here found in strong force, for in the examination of a long row of currant bushes containing many eggs, I could not find a single egg-bearing leaf which had not been visited, and the destruction of the eggs ensured. A large number of leaves were collected, each bearing perhaps from forty to fifty parasitized eggs. Reserving a few of these for study and for propagation, the remainder were made up in small parcels of about a half-dozen each, and mailed to entomological friends in various parts of the United States and Canada, with the request that they be pinned upon currant-bushes among the leaves where the currant-fly eggs were to be found. The introduction of parasites in this manner into localities where they had not previously occurred, has been shown to be practicable; and in consideration of the great importance of parasitic aid in the destruction of our

insect pests, I sincerely hope that my efforts to distribute this very efficient parasite may prove, from observations to be made hereafter, to have been successful.

Examples of the insect were sent by me to Mr. L. O. Howard, of the Department of agriculture at Washington, a gentleman who has made special study of the family to which it pertains, viz., the *chalcididae*. He informs me that there is no doubt of its being the species described and named by Dr. C. V. Riley in 1879 (Can. entom., Sept. 1879 v. 11, p. 161-162) as *Trichogramma pretiosa*, examples of which had been reared, at Washington, from eggs of the cotton-worm moth, *Aletia argillacea* Hübn., collected in Alabama. The description is reproduced, with additional information, in Prof. J. H. Comstock's Report upon cotton insects (Washington, 1879), p. 193. It has since been extensively reared from eggs of the same moth collected in Florida, by Mr. H. G. Hubbard. It has also been bred at the U. S. Department of agriculture from eggs of an unknown noctuid moth occurring on orange trees, and from *Aleyrodes*.

Dr. Riley, from some structural features, thought that it might be necessary to establish a new genus for this species and one or two closely allied ones, but Mr. Howard finds it to be a true *Trichogramma*, as at first referred.

Another species of the genus, *T. minuta* Riley,[1] has been reared from the eggs of one of our common butterflies, of extensive distribution, *Limenitis disippus*. Parasitized examples of these eggs have given from four to six specimens of the minute creature, which, notwithstanding its specific name of *minuta*, exceeds in size the microscopic *T. pretiosa*, the latter being only about 0.25 mm. in length.

In connection with the above notice of the egg-parasite of the currant-fly, it may be of interest to offer the following note of the oviposition of the currant-fly as observed by me, as its method has not to my knowledge been previously published:

June 7, 1868. *Nematus ventricosus* was seen to deposit thirty eggs upon a single currant leaf within one hour. In the act of ovipositing, it curved the tip of its abdomen downward and forward, directing its ovipositor toward its head, in which position the end of the egg is seen to protrude and attach itself to the leaf-nervure, when the ovipositor is withdrawn, and the egg left in position. Moving backward a very little, another egg is similarly deposited, and in like manner the operation is continued, until the leaf has its assigned quota, or the supply of eggs is exhausted. The eggs produced their larvae on June 14th.

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1 *Third Annual report on the insects of Missouri*, 1871, p. 158, fig. 72.

THE TARSAL AND ANTENNAL CHARACTERS OF *PSOCIDAE*.

BY HERMANN AUGUST HAGEN, CAMBRIDGE, MASS.

[Reprint from Entom. mo. mag., June 1882, v. 19, p. 12-13.]

By a mere chance I see that a statement recently published by me concerning the tarsal structure of *psocidae* confirms, in a most satisfactory manner, that made by Prof. Westwood in 1857 (Proc. Ent. soc. Lond., series 2, vol. iv, pp. 63, 64) regarding certain coleoptera.

Being occupied with the *atropina*, I was astonished to find that the young forms have only two-jointed tarsi (instead of three-jointed, as is found in the imago), but the last joint, internally, in the middle, shows a more or less visible division, where the 3rd joint (the median) will be formed, and just below it are one or two small bristles. I have observed this in *A*[*tropos*] *divinatoria* (reared by myself), *succinica*, and *oleagina*, and also in *Hyperetes tessellatus*. So long as the young have only two-jointed tarsi, the antennae have also less joints. Thus, in *A. divinatoria* the latter have only 12 instead of the 15 of the imago; in *Hyperetes* the proportions are 13 to 23. But, although the third (middle) joint of the tarsi is produced by a division of the apical, it is just the contrary with the antennae. In these the two thick basal joints, and the apical joint are not divided; but in some species all the intermediate joints are so. *Hyperetes* is in the latter case, all the 10 intermediate joints being divided in the imago, as I can show from preparations. It is a remarkable fact that the mysterious *Hyperetes* shows, in its earlier stages, precisely the normal number (13) of joints for the *psocidae*. I am not prepared to give an opinion as to this genus. Other genera, such as *Caecilius*, commonly considered to have only two-jointed tarsi, possess a small aborted third joint, just as occurs in many coleoptera.

Cambridge, Mass., 1st April, 1882.

THE CHIGOE IN AFRICA.—It is stated in Burton and Cameron's "To the Gold Coast for Gold" that the chigoe (*Pulex penetrans*) has been recently introduced and has spread all over the West African seaboard and far into the interior. At the time of Captain Burton's first visit (1862) it was unknown on the west coast; but now it ranks with the indigenous red, white and black ants, centipedes, scorpions, venomous spiders and flies of the tzetze group, as among the chief plagues of that region.—*Amer. naturalist.* June 1883. v. 17, p. 664.

PSYCHE.

CAMBRIDGE, MASS., MAY-JUNE 1883.

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REARING LEPIDOPTERA.

It will be gratifying to those entomologists who recognise the great importance of the knowledge of the early stages of insect life, to learn of the attention that is being given to this department of study by Mr. S. L. Elliot, of New York City. For the last few years, this gentleman has been indefatigable in his lepidopterological studies, and especially in larval collections and breeding from the egg. Fortunate in the ability to devote his entire time to the work, and actuated by an enthusiasm that scarcely recognises the need of any respite from the absorbing "labor of love"—very valuable and important results have already followed his labors. The life-histories of a number of rare species have been worked out. New species have been discovered, and so-called species shown to be simple varieties. Immense numbers of larvae have been collected and reared upon their food-plants, descriptions of the new forms, with the aid of Mr. Henry Edwards, have been taken, and thousands of perfect insects have been obtained for the cabinets of those who prize perfect forms. His success in carrying lepidoptera through their winter pupation, by means of a method and appliances devised by himself, has never, we believe, before been equalled. Several thousands of pupae have been carried through the past winter with scarcely any loss except that unavoidably resulting from parasitic attack. We know of no one else in the United States, who is rearing the larvæ of lepidoptera so successfully and on so large a scale.

J. A. L.

BOOK NOTICES.

It is understood that Mr. Wm. Saunders, of London, Ontario, has in preparation and has nearly completed a volume upon "The Insects of our Fruits and Fruit-trees." The great need of the information that this volume will present, has long been felt, and it is very gratifying to know that the want is soon to be supplied. The larger portion of it is already in type. Much labor has been bestowed upon its preparation to render it as complete as possible and prefectly reliable. It will make a volume, as we learn from the author, of nearly 450 pages. Almost every species noticed will be illustrated, requiring for the purpose over 400 figures. It will be issued by the well known publishing-house of Lippincott & Co., of Philadelphia, in their best style, and will be offered to the public at a price (probably $3) that will bring it within the reach of all who need it. From the distinguished ability of the author, his familiarity with fruit-culture, and the special efforts made by him to render the volume all that it should be, we are confident that it will prove to be a standard work upon the subject of which it treats, and that it cannot fail of commanding an extensive sale. *J. A. L.*

[Mr. Saunders' book has been issued since the above notice was written.]

The third part of the third volume of the Proceedings of the Davenport Academy of Natural Sciences, which came to hand in April, is devoted to the memory of Joseph

Duncan Putnam, who was foremost among the members of that society in securing for it a scientific standing as a publishing society. Besides the proceedings of the meeting held in Mr. Putnam's memory, the letters sent to his bereaved relatives by his scientific associates, and the resolutions passed by several scientific societies upon hearing of his death, Prof. Herbert Osborn, with the assistance of Dr. H. A. Hagen and others, has prepared for publication the notes upon and figures of American *solpugidae*, which Mr. Putnam had made, and which now form an interesting contribution to the study of a heretofore neglected family of American arthropoda. To this paper is added a bibliography of the *solpugidae*, complied from Mr. Putnam's by Miss Julia E. Sanders. This bibliography comprises 224 titles, with notes, and is arranged in chronological order.

G: D.

Cambridge, Mass., 14 April 1883.

A paper with the title *Rovardszati lapok* (Journal of entomology) has lately made its appearance in Pesth, Hungary. It is, however, a mistake to bury interesting entomological matter in pages printed in a language which few outside of Hungary can read.

G: D.

PROCEEDINGS OF SOCIETIES.

Cambridge Entomological Club.

9 March 1883.—The 91st meeting of the Club was held at 19 Brattle Square, Cambridge, 9 March 1883, at 8 p. m. In the absence of the President, Mr. S: Henshaw was chosen Chairman. Seven persons (five of whom were members) were present.

The additions to the library of the Club were announced by the Librarian.

Mr. G: Dimmock read a paper on "The scales of coleoptera," including in the paper observations in regard to the scales of other insects. Microscopical preparations and figures of many forms of scales were shown. [The paper is now appearing with illustrations, in Psyche.]

Mr. S: H. Scudder exhibited a figure, by Brongniart, of a very large fossil walking-stick, described under the name of *Titanophasma fayoli*.

Mr. S: H. Scudder showed a few photographs of regions in Colorado where fossil insects had been found.

Linnean Society of London.

6 Feb. 1883. . . . A paper was read "On the pairing of *Tegenaria guyonii* and description of certain organs in the male abdominal sexual region," by J. Maule Campbell. Two cases were related in which during confinement the males killed the females after union and an instance was also given of an attempt to impregnate an immature female which was also destroyed by the male. In neither case could hunger have been the cause of the attack. The writer explained these occurrences and also the accounts of females destroying males after union on the ground "That those instincts which are habitually practised throughout the far greater portion of the life of the species, and on which its existence is dependent would scarcely be suspended for a longer period than necessary for the sexual union." Some of the habits of spiders and especially of this species were mentioned as bearing on these sexual conflicts, and the specific benefits which would arise from them were referred to. The paper concluded by a note on some glands situated on the convexity of the abdominal sexual region. The ducts, considerably convoluted, open through transparent tubular spines which are arranged transversely to the axis of the body of the spider. These organs are supposed by Mr. Campbell to be a kind of spinning organ. Two papilla-like processes below the opening of the genital sinus were also described. — *Zool. anzeiger*, 5 March 1883, jahrg. 6, p. 127-128.

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard: S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Bachmann, O: Leitfaden zur anfertigung mikroskopischer dauerpräparate. München, *R. Oldenbourg*, 1879. t.-p. cover, 8+196 p., 24×15, t 17×10; 87 il. Pap., 4 M.

General instructions for making microscopic preparations: p. 68-90 treats especially of entomological preparations. *G: D.* (3235)

Barrett, C: G. Hints as to the best means of rearing larvae of *tortricidae*. (Entom. mo. mag., Jan. 1883, v. 19, p. 172-176.)

General directions for rearing the different forms of larvae of *tortricidae*. *G: D.* (3236)

Bell, James Thompson. How we captured a hornet's nest. (Can. entom., May 1881, v. 13, p. 114.)

Hornets (*vespa*) killed by injecting chloroform into their nest. *G: D.* (3237)

Berg, Cárlos. Contribuciones al estudio de las *cicadidae* de la República Argentina y países limítrofes. "(Anal. soc. cient. argent., 1882, t. 14, p. 38-48.)"

Separate. Buenos Aires, 1882. t.-p. cover, 16 p., 25×16, t 18×11.

Describes 11 species (from South America and Mexico); 6 are new species as follows: *tettigades papa, tympanoterpes elegans, proarna uruguayensis, p. montevidensis, carinela platensis*, and *derotettix* (nov. gen.) *mendosensis*. *G: D.* (3238)

Bergroth, E. Zur geographischen verbreitung einiger odonaten. (Entom. nachrichten, 15 March 1881, jahrg. 7, p. 85-88.)

Notes on numerous species of *odonata*. *G: D.* (3239)

Bertholet, A. [Présentation d'une section d'un sapin du Risoud pénétrée par les fourmis.] (Bull. soc. vaudoise des sci. nat., Oct. 1881, s. 2, v. 17; Procès-verbaux, p. 35-36.)

Mode in which species of *camponotus* had formed galleries in a spruce tree. *G: D.* (3240)

Bethune, C: James Stewart, *compiler*. Insects of the northern parts of British America. From Kirby's Fauna boreali-americana: Insecta. (Can. entom., **1870, v. 2**: April, p. 76-82; May, p. 89-93; July, p. 105-110; Sept.-Oct., p. 142-145; Dec., p. 168-176; **1871, v. 3**: June, p. 27-32; Sept., p. 88-94, 114-116; Oct., p. 134-137, 155-156; Nov., p. 172-176, 186-192; Dec., p. 211-217, 227-233; **1872, v. 4**: Feb., p. 31-36; March, p. 52-57; May, p. 93-96; June, p. 111-118; Aug., p. 151-155; Sept., p. 175-179; Oct., p. 196-198; Dec., p. 231-235; **1873, v. 5**: May, p. 96-99; June, p. 115-117; July, p. 129-132; Oct., p. 193-196; Nov., p. 210-213; **1875, v. 7**: June, p. 109-113; Aug., p. 156-159; **1877, v. 9**: Aug. p. 148-156; **1878, v. 10**: June, p. 116-118; July, p. 137-139; Nov., p. 213-217; **1878, v. 11**: Aug., p. 146-154; **1881, v. 13**: Aug., p. 162-170.)

Reprint of the parts of W: Kirby's "Fauna boreali-americana" . . . which apply to the insects of the northern parts of British America, together with notes, by the compiler, on the species and their synonymy. [*See* PSYCHE, Rec., nos. 485, 1214, and 1328.] *A. K. D.* (3241)

Bieler, S. [Appareil buccal de divers insectes.] (Bull. soc. vaudoise des sci. nat., Dec. 1880, s. 2, v. 17; Procès-verbaux, p. 6.)

Chiefly concerning the trophi of *pulex*. *G: D.* (3242)

Butler, Arthur Gardiner. Notes on some North American lepidoptera. (Papilio, July 1881, v. 1, p. 103-106.)

Describes *anceryx edwardsii* as a new species, and states that the insect known as *oenosanda noctuiformis* Walk. is a new species, and that its generic name should be *cautethia*; gives comparative and other notes on *hemaris cynoglossum, pterogon clarkiae, deidamia inscripta, choerocampa tersa, deilephila lineata, philampelus achemon, smerinthus ophthalmicus, sphinx oreodaphne, s. perelegans*, and refers *darapsa versicolor* to the genus *ampelophaga*. *H: E.* (3243)

Butler, Arthur Gardiner. Notes on some North American lepidoptera. (Papilio, Sept. 1881, v. 1, p. 128-132.)

Comparative notes on *xystus robiniae, alypia sacramenti, a. ridingsii, copidryas gloveri, gnophaela hoppferi, g. vermiculata, dahana atripennis, ctenucha subroscapus, leptarctia lena, arctia intermedia, a. achaia, a. ochracea, euchaetes collaris, phryganidea californica, hemileuca nevadensis, pseudohazis eglanterina, saturnia mendocino, clisiocampa californica*, and *eulimacodes scapha*. Refers *gnophaela* to the *arctiidae*, section *pericopidae*, and states that *ctenucha walsinghamii* Hy. Edw. = *c. rubroscapus* Men. Believes that *phryganidea californica* should be placed in the family *dioptidae*.
H: E. (3244)

Butler, Arthur Gardiner. Notes on some North American lepidoptera. (Papilio, Oct. 1881, v. 1, p. 168-171.)

Calls attention to the affinities of the *noctuidae*, particularly with reference to early stages, and gives comparative notes of several species. *H: E.* (3245)

Butler, Arthur Gardiner. Notes on some North American lepidoptera. (Papilio, Dec. 1881, v. 1, p. 220-223.)

Notes on *geometridae;* thinks *metrocampa perlata* Guen. = *m. margaritata;* compares *tetracis aegrotata* of California with *sabulodes dositheata* Guen. of Venezuela, and thinks them congeneric; refers *thamnonoma tripunctaria* Pack. to genus *lozogramma*; says that *glaucopteryx caesiata* Hübn. does not exist in United States, and that our species known by that name is undescribed; *triphosa dubitata* Pack. is not *t. dubitata* Linn. *H: E.* (3246)

Comstock: J: H: An aquatic noctuid larva. *Arzama melanopyga* Grote, new species. (Papilio, Oct. 1881, v. 1, p. 147-149.)

Describes larva and habits of *arzama melanopyga*, feeding upon the leaf-stalks of the pond-lily. (*nuphar advena*). In this paper A: R. Grote gives description (quoted by Comstock) of the imago of *a. melanopyga* as a new species, and compares it with *a. diffusa, a. vulnifica*, and *sphida obliquata*. *H: E.* (3247)

Edwards, H: Description of some new species of N. American moths. (Papilio, June 1881, v. 1, p. 100-101.)

Describes as new *euleucophaeus sororius* from Lower California, *plusia celsa* from Oregon, and *xanthothrix neumoegeni* from California; redescribes *gloveria arizonensis* Pack., from Arizona. *H: E.* (3248)

Edwards, H: Descriptions of some new species of heterocera. (Papilio, July 1881, v. 1, p. 115-121.)

Describes as new *sphinx libocedrus, anatolmis fulgens* and *zerene elegantaria* from Arizona, *sphinx utahensis* from Utah, *synedoida valens* from Southern Utah, *thyridopteryx meadii* from Mohave Desert, *gorytodes personaria* from California, *oribates versutus, o. opiparus* and *syneda occulta* from Texas, *azelina morrisonaria* from Washington Territory, *catocala emilia* from New York, *c. miranda* from District of Columbia, and *syneda faceta* from Florida; finds *oribates* occupied as a generic name, and substitutes *gyros* for it.
H: E. (3249)

Edwards, H: Joseph Duncan Putnam. (Papilio, Dec. 1881, v. 1, p. 223-224.) [Rec., 2666.]

Biographical sketch of J. D. Putnam, president of the Davenport academy of natural sciences; b. 18 Oct. 1855, in Jacksonville, Ill.; d. 10 Dec. 1881, in Davenport, Iowa. *H: E.* (3250)

Edwards, H: New genera and species of the family *aegeridae*. (Papilio, Nov. 1881, v. 1, p. 179-208, pl. 4[1].)

Describes *euhagena, larunda, carmenta* and *albuna* as new genera of *aegeriidae*, and describes as new species *trochilium pacificum, euhagena nebraskae, bembecia sequoiae, b. superba, larunda solituda, sciapteron graefii, s. scepsiformis, s. cupressi, carmenta ruficornis, c. minuta, c. sanborni, c. fraxini, albuna resplendens, a. rutilans, a. rileyana, a. artemisiae, a. montana, a. tanaceti, a. vancouverensis, a. coloradensis, a. torva, aegeria flava, a. aurata, a. corni, a. saxifragae, a. verecunda, a. brunnicipennis, a. rubrofascia, a. bolli, a. lupini, a. perplexa, a. impropria, a. sexfasciata, a. corusca, a. aureola, a. consimilis, a. hyperici, a. infirma, a. eupatorii, a imitata, a. morula, a. koebelei, a. washingtonia, a. decipiens, a neglecta, a. imperfecta, a. hemizoniae, a. senecioides, a. refulgens, a. opalescens, a. novaroensis, a giliae, a. mimuli, a. madariae, a. albicornis, a. proxima, a. inusitata, a. nicotianae, pyrrhotaenia polygoni, p. fragariae, p. helianthi, p. achillae, p. tepperi, p. eremocarpi, p. meadii, p. orthocarpi, p. texana, zenodoxus heucherae, z. potentillae, z. canescens;* describes larva of *sciapteron syringae*. Quotes Walker's descriptions of *aegeria pleciaeformis, a. pyramidalis, a. odyneriformis, a. emphytiformis, a. hylotomiformis, a. pyralidiformis, a. sapygaeformis, a. geliformis*, and gives colored figures of all these species except *a. pyralidiformis*. *H: E.* (3251)

Edwards, W: H: On certain habits of *heliconia charitonia*, Linn., a species of butterfly found in Florida. Read before the Ent. sub-sect. of Am. Ass. Cinn. 18 Aug. 1881. (Papilio, Dec. 1881, v. 1, p. 209-215.)

Paper read in part before Permanent sub-section of entomology of A. A. A. S., at Cincinnati, O., 18 Aug. 1881. States that, from observations of Dr. W: Wittfeld, of Florida, the males of *heliconia charitonia* attach themselves in numbers to the chrysalis of the female before emergence, and place themselves in coitu sometimes before the whole body of the female has freed itself from the shell. *H: E.* (3252)

Edwards, W: H: Description of a new hesperian from Florida. (Papilio, 31 May 1881, v. 1, p. 78-79.)

Describes as new *pamphila straton;* compares it with *p. leonardus* and *p. arpa*. *H: E.* (3253)

Edwards W: H: Description of the preparatory stages of *thecla henrici*, Grote. (Papilio, Oct. 1881, v. 1, p. 150-152.)

Describes egg, larval stages and chrysalis of *thecla henrici*. States that the larva feeds upon the fruit of plum-trees [*prunus*]. *H: E* (3254)

Edwards, H: A new and remarkable bombycid moth from Arizona. (Papilio, Oct. 1881, v. 1, p. 171-172.)

Describes as new *euleucophaeus neumoegeni*.
H: E. (3255)

Edwards, H: A new genus and some new forms of North American *zygaenidae*. (Papilio, 31 May 1881, v. 1, p. 80-81.)

Describes *penthetria* n. g. *zygaenidae*, *p. majuscula*, *p. parvula*, *gnophaela vermiculata* var. *continua*, *lycomorpha constans* and *l. desertus*. *H: E.* (3256)

Edwards, W: H: On *pieris bryoniae* Ochsenheimer, and its derivative forms in Europe and America. (Papilio, June 1881, v. 1, p. 84-99, pl. 2-3.)

Gives full and careful examination and diagnosis of all species or varieties, both European and American, allied to *pieris bryoniae*, with comparative notes on their resemblances and probable origin. Gives 18 colored figures, on two plates, of summer and winter forms. *H: E.* (3257)

Edwards, W: H: Some remarks on the alleged abnormal peculiarities of *argynnis myrina*. (Papilio, Sept. 1881, v. 1, p. 134-141.)

Paper read before the Permanent sub-section of entomology of the American association for the advancement of science, at Cincinnati, O., 19 Aug. 1881. Combats the opinions expressed by S: H. Scudder in his "The curious history of a butterfly" (Amer. nat., Sept. 1872, v. 6, p. 513-518) [Rec., 3274], with reference to the hibernation and other habits of *argynnis myrina* and *a. bellona*. *H: E.* (3258)

Fernald, C: H: Notes on "The *tortricidae*, *tineidae* and *pterophoridae* of South Africa. Lord Walsingham, M. A., F. Z. S.," &c. (Papilio, Dec. 1881, v. 1, p. 219-220.)

Notice of T: de Grey's [Lord Walsingham] "The *tortricidae*" etc.; explanation of the synonymy of *exartema* Clem. = *ecclopsis* Zell. *B: P. M.* (3259)

French G: Hazen. Larvae of two species of *euclea*. (Papilio, Sept. 1881, v. 1, p. 144-145.)

Describes larvae of *euclea paenulata* and *e. monitor*. *H: E.* (3260)

French, G: Hazen. Notes on the larvae of some moths. (Papilio, 31 May 1881, v. 1, p. 81-82.)

Describes larva of *arctia decorata* and *cymatophora pampinaria*. *H: E.* (3261)

French, G: Hazen. A parasite in *aegeria syringae*. Harris. (Papilio, July 1881, v. 1, p. 106.)

Records the existence of *phaeogenes ater* Cress. (fam. *ichneumonidae*) in the larva of *aegeria syringae*. *H: E.* (3262)

French, G: Hazen. Some new varieties of catocalae. (Papilio, July 1881, v. 1, p. 110-111.)

Describes as new *catocala lachrymosa* var. *evelina*, *c. lachrymosa* var. *relicta*, *c. innubens* var. *hinda*, all from Illinois. *H: E.* (3263)

Grote, A: Radcliffe. Moths collected by Prof. Snow in New Mexico, with list of *eudriini*. (Papilio, Oct. 1881, v. 1, p. 174-178.)

Describes as new *halesidota labecula*, *quadrina* n. gen. (*dryocampini*), *g. diazoma*, *rhododipsa miniana*, *bessula* n. gen. (*noctuidae*), *b. luxa*, *emplocia cephisaria*, *e. fervefactaria*, *botis toralis*; notices occurrence of *lygranthoecia spraguei* and *botis volupialis*; gives list of the tribe *eudriini*, and diagnoses the genera *euschirropterus*, *copidryas*, *eudryas* and *ciris*. *H: E.* (3264)

Grote, A: Radcliffe. New western moths. (Papilio, 31 May 1881, v. 1, p. 75-78.)

Describes *triocnemis* as a new genus of *noctuidae* and describes as new species *thyatira lorata*, *bombycia semicircularis*, *agrotis clodiana*, *hadena cinefacta* and *triocnemis saporis*, from Washington Territory, *nola fuscula* from Colorado, and *melicleptria honesta* from Oregon; re-describes *agrotis havilae*, and points out its distinctness from *a. clandestina*. *H: D.* (3265)

Grote, A: Radcliffe. Note on *agrotis repentis*. (Papilio, Sept. 1881, v. 1, p. 126-128.)

Endeavors to establish the difference between *agrotis repentis* and *a. messoria*; notices other forms resembling these species, and states that *a. cochranii* Riley = *a. repentis* G. & R., *acronycta populi* Riley = *a. lepusculina* Guen., *prodenia autumnalis* Riley = *laphygma frugiperda* Abb. & Sm., *xylina cinerea* Riley = *x. antennata* Walk., and probably *agrotis scandens* Riley = *a. messoria* Harr. and *plusia brassicae* Riley = *p. ni* Hübn. *H: E.* (3266)

Grote, A: Radcliffe. Professor Riley on *dakruma*. (Papilio, Sept. 1881, v. 1, p. 142-144.)

Contends that *dakruma* is a good genus, in opposition to a statement of C: V. Riley that it should be merged in *zophodia*. *H: E.* (3267)

Gundlach, Juan. An annotated catalogue of the diurnal lepidoptera of the island of Cuba. Based on Kirby's Synonymical catalogue. (Papilio, July 1881, v. 1, p. 111-115.)

Enumerates 53 genera and 145 species of diurnal lepidoptera, known to the author to exist in Cuba. *H: E.* (3268)

Kellicott, D: Simons. The larvae of *catocala flebilis* and *catocala amatrix*. (Papilio, Sept. 1881, v. 1, p. 141-142.)

Gives full description of larva and chrysalis of these species, *c. flebilis* feeding on *carya alba* and *c. amatrix* on *populus grandidentata*. *H: E.* (3269)

Langdon, Frank W. Bibliography of the Cincinnati fauna. (Journ. Cincinnati soc. nat. hist., April 1883, v. 6, p. 5-39.)

The part devoted to insects, by C: Dury, contains titles, references and notes on papers by James Angus, C: Dury, A: R. Grote, F: W. Langdon, J. W. Shorten, C: G. Siewers, Herman Strecker, J: A. Warder, A. G. Wetherby and Harold B. Wilson. *G: D.* (3270)

Lintner, Joseph Albert. Corrections. (Papilio, July 1881, v. 1, p. 122.)

Corrects some trifling errors in his "On some species of *nisoniades*" (*op. cit.*, 31 May 1881, v. 1, p. 69-74), [Rec., 3272] and enunciates an opinion on permanency of nomenclature. *H: E.* (3271)

Lintner, Joseph Albert. On some species of *nisoniades*. (Papilio, 31 May 1881, v. 1, p. 69-74.)

Corrections by author. (*op. cit.*, July 1881, v. 1, p. 122.)

Describes as new *nisoniades naevius*, *n. petronius*, *n. somnus*, all from Florida; gives comparative notes on *n. propertius*, *n. juvenalis*, *n. icelus*; establishes as a good species *eudamus nevada* Scudd., and notes the occurrence in N. York of *eudamus proteus*.

H: E. (3272)

Neumoegen, Berthold. A new *hemileuca* from south-eastern Arizona. (Papilio, Oct. 1881, v. 1, p. 172-174.)

Describes as new *hemileuca yavapai;* compares it with *h. juno* and *h. dido*. *H: E.* (3273)

Scudder, S: Hubbard. The curious history of a butterfly. (Amer. nat., Sep. 1872, v. 6, p. 513-518.)

Separate. [Salem, Mass., 5 Oct. 1872]. 6 p., 24×15, t 17×9.7.

Germ. tr., by A. Speyer, entitled "Seltsame geschichte eines tagfalters" ..... (Verh. k.-k. zool.-bot. ges. Wien, 1873, bd. 23; Abh., p. 145-152.)

Notice, by W: F. Kirby. (Zool. rec., for 1872, 1874, v. 9, p. 343.)

Notice, by E: Burgess. (5th ann. rept. Peabody acad. sci., for 1872, 1873, p. 107, 108.)

Crit. rev., by W: H: Edwards, entitled "Some remarks on the alleged abnormal peculiarities of *argynnis myrina*." (Papilio, Sep. 1881, v. 1, p. 134-141.)

"There are two sets of individuals [of *brenthis bellona*], each following its own cycle of changes, apparently with as little to do with the other set as if it were a different species; each set has its own distinct seasons and thus gives rise to the apparition of two or three successive 'broods' in the course of the year." Explanation of the relations of these apparent broods. [*For further notice, see title of Speyer's translation* (Rec., 3277).] *G: D.* (3274)

Scudder, S: Hubbard. A new and unusually perfect carboniferous cockroach from Mazon Creek, Ill. (Proc. Bost. soc. nat. hist., [6] Sep. 1882, v. 21, p. 391-396.)

Description of *etoblattina mazona*, n. sp.

G: D. (3275)

Scudder, S: Hubbard. Notes on some of the tertiary neuroptera of Florissant, Colo., and Green River, Wyoming Terr. (Proc. Bost. soc. nat. hist., [12] Oct. 1882, v. 21, p. 407-409.)

General discussion of the tertiary neuroptera from the above regions. *G: D.* (3276)

Scudder, S: Hubbard. Seltsame geschichte eines tagfalters aus dem American naturalist, September, vol. 6, 1872, übers. und mit bemerkungen versehen von Dr. Ad. Speyer in Rhoden. (Verh. k.-k. zool.-bot. ges. Wien, 1873, bd. 23; Abh , p. 145-152.)

Separate. [Wien, 1873]. 8 p., t 17×10.5.

Reprint. (Deutsche entom. zeitschr., 1875, bd. 19, p. 145-155.)

Notice. (Psyche, June 1875, v. 1, p. 78; Rec , 190.)

Germ. tr., by A. Speyer, of author's "The curious history of a butterfly" (Amer. nat., Sep. 1872, v. 6, p. 513-518) [Rec., 3274], with an additional note by author. *G: D.* (3277)

Spångberg, Jacob. Species jassi generis homopterorum. (Öfversigt af kongl. vetenskaps-akademiens förhandlingar, 1878, n:o 8.) Stockholm, 1878. p. 3-40, 22×14, t 17.5×10.

Describes 51 (26 new) species of *jassus*, of which 3 (*j. melanotus* and *j. fuscipennis* = 2 new) species are from the United States, and 5 (*j. pustulatus* and *j. flaviceps* = 2 new) species are from Mexico.

G: D. (3278)

Spångberg, Jacob. *Psocina* Sueciae et Fenniae. Öfversigt af Sveriges och Finlands psociner. (Öfversigt af kongl. vetenskaps-akademiens förhandlingar, 1878, n:o 2.) Stockholm, 1878. p. 5-29, pl. 1-2, 22×24.

Synoptic tables for separating the genera and species of *psocidae* of Sweden and Finland, with figures to illustrate the venation of the wings. [Some of the species are also found in the United States.] *G: D.* (3279)

Spångberg, Jacob. Homoptera nonnulla americana nova vel minus cognita. (Öfversigt af kongl. vetenskaps-akademiens förhandlingar, 1879, n:o 6.) Stockholm, 1879. p. 17-26, pl. 15-16, 22×14, t 17.5×10.

Describes and figures *jassus borealis* (n. sp.) from North America and *j. gratiosus* (n. sp.) from Mexico, besides species of *gypona*, *petalopoda*, *terulia*, and *jassus* from other localities. *G: D.* (3280)

Spångberg, Jacob. Species gyponae generis homopterorum. (Bihang till k. svenska vet.-akad. handlingar, band 5, n:o 3.) Stockholm, 1878. 76 p., 22×14, t 17.5×10.

Describes 96 (55 new) species of *gypona* and notes 11 species unknown to him. The species described are as follows: United States, 19 (15 new); Mexico, 16 (6 new) of which 2 species are also found in South America; South America, 60 (34 new); and Tahiti (?), 1 new species. *G: D.* (3281)

Stretch, R: H. Notes on the genus *clisiocampa*, Curtis. With description of new species. (Papilio, 31 May 1881, v. 1, p. 63-69.)

Describes as new *clisiocampa fragilis*, *c. constricta*, *c. strigosa*, *c erosa*, *c. thoracica;* describes larva and cocoon of *c. californica*, *c. constricta*, *c. erosa;* gives notes and synonymy of *c. americana* and *c. disstria*, and records singular habit of larva of *c. californica*.

H: E. (3282)

ENTOMOLOGICAL ITEMS.

PROF. WILHELM PETERS, director of the zoological museum of the university of Berlin, died 20 April 1883. He was born 22 April 1815, at Koldenbüttel, Kreis Eiderstet, Germany.

MR. A. W. P. CRAMER notes in the *Bulletin of the Brooklyn Entomological Society* for April 1883, the capture of two specimens of *Catocala unijuga* on shipboard, in mid-ocean off the coast of Newfoundland.

IN THE seventeenth annual course of lectures to mechanics at the Sheffield scientific school, New Haven, Conn., lately completed, Dr. E. H. Jenkins delivered a lecture on the agency of insects in the fertilization of flowers.

THE ENTOMOLOGICAL Society of France, in its last meeting in February, gave the Dollfus prize to M. Bedel, author of the "Faune der coléoptères du bassin de la Seine," for the part of his work devoted to the rhyncophora which appeared in the annales of the society for 1882.

WE ARE glad to see that the Ottawa field naturalists' club maintains such activity. Excursions, the publication of its transactions, soirees, and prizes for collections and original work, stimulate the members to industry. Mr. W. H. Harrington is the secretary, and Messrs. Harrington, J. Fletcher and J. B. Tyrrell are leaders in entomology.

THE WORCESTER (Mass.) Lyceum and natural history association held its annual meeting 12 May 1883. From a two and one-half column review of the reports of its different officers, as given in the *Worcester daily spy* of 14 May, we learn that Mr. F. G. Sanborn gave, during the past year, a course of 8 lessons on entomology to 10 students. We are glad to see the progress made by the association in popular instruction in natural science and we know from personal experience the fitness of Mr. Sanborn, who is curator of the association's museum, for the work of exciting interest among young people in the study of natural history.

THE *Deutsch-Amerikanische Apotheker-Zeitung*, 1 Apr. 1883, jahrg. 4, p. 49, states that Dr. E. F. Brush, of New York, recommends a concentrated tincture of common black ants as a remedy for scurvy, or the ants themselves may be used for that purpose. He bases his recommendation on observations made among the wood-choppers in Maine, who are very apt to be affected with scurvy on account of being restricted for long times to feeding on preserved food and eat masses of black ants as a remedy. The editor of the D.-A. A.-Z. says this is only on account of the formic acid contained in the ants, and altho it may be the most convenient way of getting this acid in the woods it is not necessary to eat ants for the purpose

WE HAVE lately received the first four numeros of "Natura. Maandschrift voor Natuurwetenschappen," a new monthly issued by the natural science society of Ghent, Belgium. The name of J. MacLeod in the list of working members of the society, as well as the contents of the numeros received, promise that the new journal will not lack entomological papers. The price of *Natura* is seven francs per year

THROUGH LACK of familiarity with the literature of the subject, Mr. R. H. Stretch has redescribed (Papilio, Feb. [March] 1883, v. 3, p. 41-42), the anal appendages of the male of *Leucarctia acraea*. These were originally described by H. K. Morrison (Psyche, Oct. 1874, v. 1, p. 21-22), who also found similar organs in *Danais archippus*, *Agrotis plecta*, and *Euplexia lucipara*. This organ in *Danais* is briefly described in E. Burgess' "Contributions to the anatomy of the milk-weed butterfly, *Danais archippus*" (Boston, 1880), without mention of its earlier discoverer. Similar organs have been described and figured by C. G. Siewers (Canadian entomologist, March 1879, v. 11, p. 47-48) who found them in males of *Callimorpha interruptomarginata*, and concluded that they aided the insect in flight. Siewer's article is noticed in the Entomologist's monthly magazine, June 1879, v. 16, p. 19.

NOTICES TO ENTOMOLOGISTS.

In accordance with a resolution passed at a meeting of the Entomologists in attendance at the Montreal meeting of the American Association for the Advancement of Science, in August, 1882, authorizing me to call and "to provide for similar meetings for Entomological discussions at the future annual gatherings of the Association," I herewith name Wednesday, August 15th, 3 o'clock, P. M., as the time for the first of the series of the Minneapolis (Minn.) meetings, — the place of meeting to be named hereafter.

All interested in Entomology are respectfully invited to attend the meetings and participate in the discussions.

J. A. LINTNER.

Albany, June 1, 1883.

A special public meeting of the Cambridge entomological club will be held in Minneapolis, Minn., at 2 P. M., on Tuesday, 14 August, to which meeting all members and other persons interested in entomology are invited.

B: PICKMAN MANN, *Pres.*
G: DIMMOCK, *Sec.*

SOCIETY MEETINGS.

THE REGULAR meetings of the Cambridge Entomological Club will be held at 7.45 p. m., on the days following:—

13 Oct. 1882.	9 Mar. 1883.
10 Nov. "	13 Apr. "
8 Dec. "	11 May "
12 Jan. 1883.	8 June "
9 Feb. "	

G. DIMMOCK, *Secretary.*

THE NEW YORK Entomological Club meets twice monthly, except in June, July and August, but no special date is fixed for each meeting.

HENRY EDWARDS, *Secretary.*

THE REGULAR meetings of the Entomological Section of the Boston Society of Natural History will be held at N. W. corner of Berkeley and Boylston Sts., Boston, Mass., at 7.45 p. m., on the days following:—

25 Oct. 1882.	28 Feb. 1883.
22 Nov. "	28 Mar. "
27 Dec. "	25 Apr. "
24 Jan. 1883.	23 May "

EDWARD BURGESS, *Secretary.*

THE REGULAR meetings of the Entomological Section of the Academy of Natural Sciences, of Philadelphia, Pa., will be held at S. W. corner of 19th and Race Sts., on the days following:—

14 Oct. 1881.	10 Mar. 1882.
11 Nov. "	14 Apr. "
9 Dec. "	12 May "
13 Jan. 1882.	9 June "
10 Feb. "	

JAMES H. RIDINGS, *Recorder.*

THE SEMI-ANNUAL meetings of the American Entomological Society will be held at S. W. corner of 19th and Race Sts., Philadelphia, Pa., on the days following:—

12 Dec. 1881. 12 June 1882.

JAMES H. RIDINGS, *Recording Secretary.*

THE REGULAR monthly meetings of the Montreal Branch of the Entomological Society of Ontario, will be held at Montreal, Que., Canada, on the days following:—

3 Oct. 1882.	6 Feb. 1883.
7 Nov. "	6 Mar. "
5 Dec. "	3 Apr. "
9 Jan. 1883.	1 May "

G. J. BOWLES, *Secretary.*

THE MONTHLY meetings of the Brooklyn Entomological Society will be held in the rooms of Wright's Business College, Broadway, corner of Fourth Street, Brooklyn, E. D., the last Saturday of each month except July and August.

F. G. SCHAUPP, *Secretary.*

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B: PICKMAN MANN, *Washington, D. C.;* G: DIMMOCK, *Cambridge, Mass.;* ALBERT J: COOK, *Lansing, Mich.;* STEPHEN ALFRED FORBES, *Normal, Ill.;* JOSEPH ALBERT LINTNER, *Albany, N. Y.;* FRANCIS HUNTINGTON SNOW, *Lawrence, Kansas;* W: TRELEASE, *Madison, Wisc.*

Vol. 4. No. 111-112.

JULY-AUGUST 1883.

CONTENTS:

ADVERTISEMENTS 62
THE SCALES OF COLEOPTERA—*George Dimmock* 63-71
THE CLASSIFICATION OF THE TINEIDAE—*Vactor Tousey Chambers* . . . 71-74
CAPTURES OF FENISECA TARQUINIUS FABR.—*Joseph Albert Lintner* . . . 75
PROCEEDINGS OF SOCIETIES.—Entomological Society of London—Zoological Society of London—Linnean Society of New South Wales . . . 75-76
BIBLIOGRAPHICAL RECORD, no. 3283-3291 77-78
ENTOMOLOGICAL ITEMS—Society Meetings 79-80

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EARLY STAGES OF BUTTERFLIES WANTED.

The undersigned desires to obtain, by exchange or otherwise, from all parts of the world, eggs, caterpillars and chrysalids of Diurnal Lepidoptera. Dried specimens are preferred, especially of caterpillars, which should be prepared by inflation. Correspondence is invited with persons engaged in the study of the early stages of butterflies.

S. H. SCUDDER,
Cambridge, Mass.

COCCIDAE WANTED.

The undersigned is desirous of obtaining, by exchange or otherwise, specimens of as many species of the COCCIDAE as possible, for the purpose of making a study of the North American forms. Those found infesting cultivated plants especially desired. Living specimens preferred when they can be obtained.

J. HENRY COMSTOCK,
Department of Entomology,
The Cornell University,
Ithaca, N. Y.

GALLS AND GALL INSECTS.

The undersigned desires, either by exchange or otherwise, Galls from all parts of the United States. He is especially interested in those made by *Lepidoptera, Coleoptera, Homoptera and Diptera.* Correspondence in reference to Gall growths, or other vegetable abnormities, is invited. CHARLES V. RILEY,
1700 Thirteenth St., N. W.,
Washington, D. C.

TORTRICIDAE WANTED.

I am desirous of obtaining as many North American TORTRICIDAE as possible, for the purpose of studying this family. I shall be glad to name and return any TORTRICIDAE forwarded to me for this purpose, save such as may prove new and desirable to retain for description.

Pack carefully, and direct to
PROF. C. H. FERNALD, Orono, Me.

LEPIDOPTERA.

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PSYCHE.

THE SCALES OF COLEOPTERA.

BY GEORGE DIMMOCK, CAMBRIDGE, MASS.

(*Continued from page 47.*)

GENERAL SUMMARY.

After the preceding descriptions of some forms of scales among coleoptera, I wish to consider the subject more generally. First to be considered is the question, in what families of coleoptera have scales been found. Fischer mentioned scales as occurring in *teredyles*, *clavicornes*, *lamellicornes* and *curculionides*,—or to use the modern equivalents for the families in which he found scale-bearing species,— in the *cleridae*, *ptinidae*, *dermestidae*, *byrrhidae*, *scarabaeidae* and *curculionidae*. To this list I would add with certainty the *elateridae*, basing this addition on the scales of *Chalcolepidius* and *Alaus* described in this paper. According to my views of what constitutes a scale I would add further the *cerambycidae*, and with some doubt the *buprestidae*. The scales of *Clytus robiniae* described in this paper, it seems to me, can scarcely be called hairs, altho to the naked eye or to a low-power lens they appear like hairs. They are too much flattened and the striae end in the manner in which they do in scales. The question whether the sword-shaped appendages of *Psiloptera drummondi* are really scales or hairs is less easily settled but I should be inclined, from the arrangement of their striae, to term them scales. The form of scale from *Alaus* is readily seen, by the figure of its transverse section (fig. 7, *d*), to be too flat to be termed a hair, and this or similar forms are not uncommon among coleoptera.

The question of the morphological identity of scales and hairs of insects has been long since settled, so that the question of whether an appendage is a scale or hair has little importance. The extremely minute spines or hairs upon the wings of diptera, hymenoptera and other insects are simply another form of scales. It is only in insects where certain kinds of brilliant coloration have been developed that one finds scales. This leads to a consideration of how hairs and scales of insects affect coloration. They may simply cover a surface of the same color as their own; in such cases hairs may, according to the angle in which they stand, their abundance or their length, give rise to appearances which we designate as pubescent, velvety, pilose, sericeous, etc.: scales under similar circumstances may give rise to similar appearances, but are

most often imbricated and usually cause more lustre than hairs. Hairs or scales may be of a different color from the surface on which they are placed. If they are numerous and opake they may entirely conceal the surface on which they are inserted, as the white hairs hide the bronze surface of the sides of the thorax in *Cicindela dorsalis*, and as the white scales of *Alaus oculatus* hide the black surface beneath the rings on the thorax; or they may only partly conceal the surface of the insect, giving rise to coarser and finer mixtures and shades of color. Opake scales, or hairs, of more than one color, may cause figuration, whether they imbricate as on the wings of lepidoptera, or are separated as on *Anthrenus scrophulariae*.

The possibilities of varying effects of color are many with opake scales and hairs, but with transparent ones, especially if they are colored, the effects of color can be multiplied still further. With hairs the effects are not so remarkable as with scales. The scale, by its form, increases the number of layers of the surface of an insect which are available for colorational purposes. Where the surface of an elytron had previously a cuticular and hypodermal layer, by the addition of a scale of the simplest type there is an addition of two cuticular and, theoretically at least, two hypodermal or sub-cuticular layers; in all six layers, without counting overlappings of imbricated scales. Some of these surfaces may have pigments, striae, hairs and other appliances to produce colors, and other surfaces may have other striae and contrivances to act on the colors produced. The numerous modifications need not be enumerated here. I have alluded to special effects of coloration in describing the scales of different insects and shall again refer to some of them when discussing the modes by which the scales themselves are colored. I may add here that the general effect of transparent scales is to produce metallic coloration.

The kinds of coloration in coleoptera have been neatly tabulated by Fischer, according to the families of these insects. I translate his table, making in it, a few alterations based upon my own observations and indicated by italics. (*See next page.*)

Next to the consideration of how the color and presence of scales and hairs affect the appearance of surfaces to which they are attached is the not less interesting question of the causes of coloration in scales themselves. But before considering the causes of color, properly speaking, a few words are appropriate on the causes which produce silvery and milk-white appearances in scales and on insects. Leydig was the first, in 1855, to call attention to the presence of air between or beneath their chitin layers as a cause for certain silvery spots and scales on insects. He speaks of air in the finer pore-canals of *Ixodes testudinis*, giving these canals a black appearance, but causing the whitish grey color of the skin. So too he mentions silvery scales on a spider, *Salticus*, and glistening hairs on another spider, *Clubione*

	COLORS			By special epidermal structures such as				
	One	Several	In the substance	Hairs	Scales	Forming designs	Metallic lustre	Surface hairy[1]
Carabici	Commonly	More rarely	Always	*Sometimes*	Never	Not rarely	Very often	Rarely
Hydrocanthari	More rarely	Commonly	"	Never	"	" "	Very rarely	"
Brachelytrini	Commonly	"	Usually	Rarely	"	Not commonly	Not rarely	Commonly
Sternoxi	More rarely	"	"	"	*Sometimes*	Commonly	Commonly	"
Malacodermatici	" "	"	Always	Never	Never	Not commonly	"	"
Teredyles	Commonly	"	Sometimes	Sometimes	Rarely	Not rarely	Very rarely	"
Clavicornes	"	Very commonly	Usually	Commonly	"	Very commonly	Not commonly	"
Palpicornes	"	Rarely	Always	Never	Never	Rarely	" "	Rarely
Lamellicornes	More rarely	Commonly	Usually	Rarely	Often	Commonly	Very many	Commonly
Melanosomatici	Always	Never	——	——	——	——	Never	Never
Taxiceratici	Commonly	More rarely	Always	Never	Never	Rarely	Very rarely	Rarely
Tenebrionini	"	" "	"	"	"	"	" "	"
Helopii	More rarely	Commonly	"	"	"	"	Rarely	Very rarely
Trachelini	" "	"	Almost always	Rarely	"	Not rarely	Never	Commonly
Vesicantes	Usually	Very rarely	Always	Never	"	Very rarely	Usually	Rarely
Steuelytrini	Commonly	More rarely	"	"	"	Not rarely	Commonly	"
Curculionides	Rarely	Usually	Rarely	Commonly	Very commonly	Very commonly	"	Commonly
Xylophagi	Usually	Rarely	Always	Never	Never	Not rarely	Never	"
Longicornes	Rarely	Usually	Commonly	Commonly	*Sometimes*	Very commonly	Very rarely	Usually
Chrysomelini	Commonly	More commonly	*Usually*	*Rarely*	Never	" "	Very commonly	Very rarely
Erotylini	"	Commonly	Always	Never	"	Rarely	Very rarely	Rarely
Coccinellini	Rarely	Usually	"	"	"	Usually	Never	"
Pselaphii	Commonly	Commonly	"	"	"	Never	"	Commonly

[1] Without regard to coloration or figuration.

claustraria, which appendages owe their silvery whiteness to air within them. Again he mentions hairs which contain air on spiders of the genera *Epeira* and *Theridium*. Then further, when considering the insects, Leydig writes that it is not difficult to see that the silvery under surface of *Hydrometra paludum* is due to the pore-canals being filled with air. He goes on to say "In a similar way the wings of *Notonecta glauca* seem to enclose air, and I suspect also that the white color of the hairy powder of many *aphidae* and *coccidae* is brought about by like causes." Further on he writes, "If one regards the color of scales it can inhere as diffuse material in the substance of the scale itself, or it appears under the form of molecular pigment, which is deposited in the cavities of the scales, or finally the cavities are filled with air which gives a snow-white appearance to the scale." Again Leydig writes that when Fischer says, in speaking of "granulation-scales" (i. e., such scales as those of *Hoplia trifasciata*), "that the 'upper or granulation layer' dissolved visibly in water, but quickly in alcohol or ether, and then only the 'striate basal layer' remained, the words show that he has certainly seen but incorrectly explained that change which the scale undergoes upon the loss of air, in so far as he assumed a 'granulation layer' which dissolves in water!"

Leydig accounted for silvery glistening scales and surfaces, and for milk-white coloration among insects, but he fails to account for the difference between these two kinds of coloration. The white scales of *Pieris rapae* and the silvery scales on the under side of the posterior wings of *Argynnis idalia* both contain no appreciable coloring matter, and both contain air; both, too, are simply milk-white by transmitted light. The difference is that there must be in the silvery scales a polished surface towards the observer. Ground glass does not appear silvery, but what is the surface of the smoothest polished plate of glass but finely ground glass? Ground glass differs from polished glass only in degree; in ground glass the scratches are so coarse and so abundant as to turn most of the light-waves into the glass again, where they are lost. In polished glass the scratches are still present, but have become so small that even the waves of light are large in proportion to them, and so the light-waves reflect as if from a theoretically flat surface. But something more than a polished glass is needed to reflect much light, for most of the light passes through the glass; something non-transparent must be behind the glass. In the common mirror it is a mercury amalgam: in the butterfly's silvery scale it is a layer of cavities filled with air. This layer of cavities is not transparent for the same reason that ground glass is not. If we treat the scale with chloroform it has an analogous effect to that of treating the back of a common mirror with nitric acid, thus dissolving off the amalgam. In both cases a non-trans-

parent body is converted into a transparent one, and a mirror, which, whatever be the materials of which it is made, if approximately perfect has a silvery appearance from the *amount* of reflected light, is reduced to a slightly reflecting surface. But let the scale dry again from its bath, as Fischer apparently did not do, and the mirror will again appear. Both silvery and milk-white colorations are then only optical effects produced by reflected light.

Still another kind of appearance is seen in the scales of *Hoplia* and of *Entimus*. These scales are brilliantly colored, yet their color is in the one case entirely lost, in the other case greatly changed by wetting with almost any liquid, but when redried the colors reappear with all their previous brilliancy. This coloration also resists all forms of bleaching. It must therefore be produced by some decomposition of light. Whatever acts upon the light must be within the scale, not upon the outside, for all those scales which remain perfectly sealed, so that the liquid does not enter them, retain their color even surrounded by liquid. This proves that the color is not due to external striation, where such exists. The finer striation of the scales of *Entimus* is evidently internal, from its relations to the differently colored internal cavities of the scales. Besides this striation the interior of the scale is evidently filled with a pith-like substance into which liquids enter with equal readiness in all directions; this pith-like portion apparently has some direct influence upon the production of the coloration, for wherever it is injured or has shrunk away from the basal end of a scale there is no longer coloration in that place. Perhaps it is a necessary filling to cause the striae to refract the light, the same as air-cavities are necessary as a backing to produce the silvery color in the scales of lepidoptera. The striae themselves are very fine, but whether they are the causes of color is hard to determine without more accurate instruments of measurement than I have at my command. As near as I could determine they are 0.0008 to 0.0009 mm. apart. The wave length of a ray of light from Frauenhofer's *A* line of the spectrum is, according to Willigen, .00076092 mm., and the wave length at the H_1 line is, according to the same authority, 0.00039713 mm.; the difference being 0.00036379 mm., or the difference of wave length between violet and red light. To determine the *place* in the spectrum to which the striae of these scales correspond would require, of course, much finer measurements.

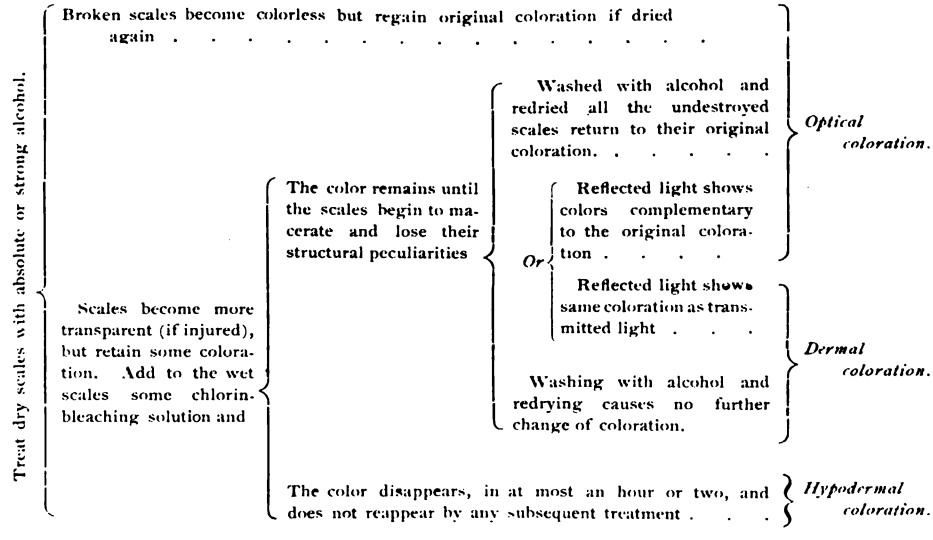
The kinds of coloration of scales thus far described are what Hagen has termed "optical colors."

The second kind of coloration is what Hagen terms "natural colors," of which he distinguishes two kinds—dermal, where "the pigment is deposited in the form of very small nuclei in the cell, or in the product of cells, in the cuticula," and hypodermal, where "the pigment is a homogeneous fatty substance, a kind of dye somewhat

condensed." Hagen further says "To a certain extent the dermal colors may have been derived from hypodermal colors, as the cuticula is secreted by the hypodermis, and the colors may have been changed by oxidation and air-tight seclusion." Like organic colors in general, I have found dermal as well as hypodermal colors to be subject to the chlorin bleaching processes, which I first applied, in 1875, for the purpose of studying the venation of lepidoptera,[39-40] the only difference being this, that dermal colors require to be freed, by long maceration, from their prison in the chitin.

Thus a distinction between dermal and hypodermal colors is that the former bleach only by destruction of the parts in which they are enclosed, the latter bleach readily. I do not wish to enter here into a prolonged discussion of the chemical reactions which are similar or alike in dermal and hypodermal colors, which I hope to discuss later, after more experiments, but will add a table which I think will serve for the separation, under the microscope, of the different kinds of coloration.

By this and other modes of separation I have studied all the scales of coleoptera which I had at my command, and


Treat dry scales with absolute or strong alcohol.
Broken scales become colorless but regain original coloration if dried again . . . . . .
Scales become more transparent (if injured), but retain some coloration. Add to the wet scales some chlorin-bleaching solution and
The color remains until the scales begin to macerate and lose their structural peculiarities
Washed with alcohol and redried all the undestroyed scales return to their original coloration. . . . . .
Optical coloration.
Or
Reflected light shows colors complementary to the original coloration . . . .
Reflected light shows same coloration as transmitted light . . .
Dermal coloration.
Washing with alcohol and redrying causes no further change of coloration.
The color disappears, in at most an hour or two, and does not reappear by any subsequent treatment . . .
Hypodermal coloration.

I have only found optical and dermal (never hypodermal) coloration: optical coloration being common. In the case of lepidoptera, optical coloration, except where concealed or subdued by hypodermal coloration, is somewhat rare, and I have never discovered scales where dermal coloration occurred. (This may occur in brilliant gold

[39] Dimmock, G. Bleaching the wings of lepidoptera. (Psyche, Sept. 1875, v. 1, p. 97-99.)

[40] Dimmock, G. A method of bleaching wings of lepidoptera, to facilitate the study of their venation. (Proc. Amer. assoc. advanc. sci., 1875, v. 24, p. 228-230.)

colored scales, such as some species of *Plusia* present, but I had none at hand to examine.)

I may here note an interesting object on which to try this mode of color-separation—this object is the head of a freshly killed larva of *Smerinthus*. Upon the application of strong alcohol the tubercles lose their milky whiteness from the loss of air, thus proving optical coloration. Chlorin bleaching-fluids rapidly destroy the green color of the fluids of the head, proving it to be hypodermal, while the outer chitin-shell, or covering of the head, resists all bleaching action, remaining green until it is macerated.

After what has been given already in the descriptive portion of this paper there is little to be said, based on my own work, in regard to the structure of scales. A point worthy of mention is perhaps this, that I have found but one insect having scales or hairs, in which these appendages did not contain more or less air. This insect is *Chalcolepidius*. The elytra themselves, in many cases where they are white (e.g., in *Cicindela dorsalis*), have spaces within them, besides the tracheae, reserved for air, as well as spaces for the fluids of the body. When so-called "blooms" are present, as upon the dorsal surface of the abdomen of some species of *Tabanus*, this bloom is often produced by very minute thin-walled hairs. Where very light colors, and white, whether milk-white or silvery-white, are present in insects, the existence of air beneath the cuticula is the rule.

I cannot yet wholly understand why the scales of lepidoptera discharge the air contained in them so much more readily, when subjected to treatment with alcohol and chloroform, than do the scales of coleoptera, while, on the other hand, water will drive out the air from scales of coleoptera much quicker than from scales of lepidoptera. There are several things which might cause these phenomena, but I am inclined to the opinion, without having *proved* its correctness, that their cause is the presence of more oil in the scales of lepidoptera than in those of coleoptera. This would concide with the greater lustre of lepidopterous scales, and with other points in their appearance. Perhaps the entrance of the shank of the scale is only closed with an oily mass, for I have never seen the scale of a lepidopteron resist entirely the entrance of fluid, as is often the case with the scales of coleoptera.

The striae upon scales of lepidoptera have long been a subject of investigation, but, as far as I know, no one, up to 1880, published the fact that their striae were upon the outside, or upon the side turned away from the wing. In Burgess' paper on *Danais*,[41] in that year, he figures transverse sections of the scales of that butterfly, and calls attention to the fact. Without having seen Burgess' paper, in the following year, I noticed that the striae upon the scales of the proboscis of *Culex* were on the outside, and so

[41] Burgess, E. Contributions to the anatomy of the milk-weed butterfly, *Danais archippus*. (Anniv. mem. Bost. soc. nat. hist., 1880.) Separate, p. 6, note; pl. 1, fig. 6 and 6*a*.

figured them in my dissertation[42] and in *Psyche*.[43] By the transverse section of a scale of *Alaus*, figured in this paper, it will be seen that there too the striae are upon the outer surface. That I have found to be the case with the principal or external striae, in all beetle-scales which I have examined. It is, briefly expressed, only the development of a mechanical law, which extends to many surfaces which shrink by drying or cooling. It can be easily illustrated by partly filling a bladder with water and allowing it to dry upon a board. The main folds will be, of course, upon the exposed upper side, and the longitudinal ones will be the more prominent.

Another easy way to prove that the striae upon the scales of the wings of lepidoptera are upon the side away from the wing is to take impressions of the scales upon a surface of collodion. These impressions are readily taken by pressing quite lightly a dry butterfly's wing upon a microscope slide which has been moistened with a solution of collodion in ether. The wing should be removed before the collodion has become thoroughly dry, when beautiful impressions of the outer surface of the scales will remain on the collodion surface, and may be mounted for future study. A very little practice will enable one to remove the wing at the proper moment; if left too long the greater part of the scales will be removed from the wing and adhere to the collodion. In order to take impressions of the under sides of scales, the latter should be transferred, by a process described by Berge,[45] and later by H. Landois,[46] and others, to a piece of paper, and the impression on collodion then taken from these inverted scales. The process of transferring the scales to paper or other surfaces, first used to get prettily colored figures of butterflies, consists, leaving out details, in gumming the wing of a butterfly upon paper with gum arabic or glue, and, after thorough drying, removing the wing, leaving the scales attached to the paper. From such "butterfly pictures" impressions of the under surface of the scales can be readily taken.

By rubbing anilin colors into impressions of the striae of the scales of insects I hope later to gain further knowledge of the external configuration of insect scales.

Fischer, in his dissertation, mentioned that branching or notched hairs seemed a characteristic of the *scarabaeidae*, and I have only found them in that family of coleoptera, although, outside of coleoptera, they are not rare (e. g., in *Bombus* and other hymenoptera). Among the *scarabaeidae* this notching, or covering of the surface of the hairs with secondary hairs, extends also to the scales, and we have some that, like those of *Hoplia*, seen in fig. 3 *b* and *c* (p. 10), present the general appearance of cactus leaves.

[42]Dimmock, G. The anatomy of the mouth-parts and of the sucking apparatus of some diptera. Dissertation . . . Leipzig university . . . 1881. Pl. 1, fig. 8, 12–15.

[43]Dimmock, G. Anatomy of the mouth-parts and of the suctorial apparatus of *culex*. (Psyche, July-Sept. 1881 [7 March 1882], v. 3, p. 231–241, pl. 1.)

[45]Berge, T. Taschenbuch für käfer- und schmetterlingssammler . . . Stuttgart, 1847, p. 55–62.

[46]Landois, H. Neue methode schmetterlinge zu copiren. (Zeitschr. f. wissensch, zool., 1866, v. 16, p. 133–134.)

There is little need of comment upon Fischer's classification of scales of coleoptera into conchiform scales (Muschelschuppen), metallic scales (Metalblattschuppen), granulated scales (Granulationsschuppen), piliferous and shaggy scales (Haar- und Zottenschuppen) and fibrous scales (Faserschuppen). Leydig, as quoted above, destroyed the value of the division of granulated scales, and I have found that the division of fibrous scales owes its origin to what Fischer would call "granulations," that is to air-spaces, only that, in this case the granulations are arranged longitudinally in stripes. I can present no new classification of scales, if such a classification is possible, without studying more forms.

Before concluding this paper I will add a note on the mode which I have employed to gather scales, and some other minute objects of like nature, together upon one place on a microscope slide. The process consists in putting the scales in a drop of some quickly evaporating substance — chloroform is best for most purposes — on the slides. The scales will form in a kind of whirlpool, nearly all the scales finally settling down, as the liquid evaporates, in one place on the slide. Rapping the slide gently sometimes aids in the collecting together of the scales, and the tip of the scalpel used to scrape the scales from the insect can be washed in the drop of chloriform, thus saving every scale when they are from a rare specimen from which one desires to remove only a few scales. By inclining the slide gently, the mass of floating scales can be made to settle on the exact centre of the glass. One part of Canada balsam added to several hundred parts of chloroform will cause the scales to stick firmly to the slide.

(To be continued by a notice of some literature seen since preparing the original paper.)

THE CLASSIFICATION OF THE TINEIDAE.

BY VACTOR TOUSEY CHAMBERS, COVINGTON, KY.

My attention has just been called to an article by Mr. Grote in *Papilio*, vol. 3. On page 43 he writes "I do not wish to enter into an argument as to the best classification of the *tineidae*, but disagreeing with Mr. Chambers, I do not think any one would take *Anaphora* for any thing but a tineid ;" and on page 38 he writes, "So far as I have studied them we appear to be able to classify our moths under *sphingidae— tineidae*", &c., &c., naming the families usually adopted. I refer to this subject because the first of these above-quoted passages conveys the impression that I have stated that *Anaphora* ought to be placed elsewhere than in *tineidae*, and because the second quotation gives me an opportunity to write more fully than I have elsewhere done as to the classification of the *tineidae* ; an opportunity that I desire because two such distinguished entomologists as Lord Walsingham and Mr. Grote have, very courteously of course, taken me to task for the expression of opinions as to the classification of the *tineidae* which are by them considered more or less

heterodox. I am not aware that I have anywhere expressed such an opinion as is by implication at least attributed to me in the above quotation as to the position of *Anaphora*. Mr. Grote was, I suppose, thinking of some remarks by me in an article in a previous number of *Papilio*, which was written in response to one by Lord Walsingham. His Lordship had stated that "It is surely easier at first sight to separate these [tineid] genera from those of other families" &c., than to locate or separate certain other genera of those other families, thus seeming to convey the idea that there is a something, *je ne sais quoi*, about the tineid genera referred to by him which made it comparatively easy, "at first sight," to refer them to the *tineidae;* and if Mr. Grote will look at my paper in *Papilio* a little more carefully he will see that my remarks upon *Anaphora* hinge upon the words of Lord Walsingham, "at first sight;" and that while I do not deny the tineid affinities of *Anaphora* I was unable to see with Lord Walsingham this indefinable and to me inappreciable something which makes the location of the tineid genera among the *tineidae* easy "at first sight" as compared with the genera of other families mentioned by his Lordship; and I instanced *Anaphora* as a tineid genus which at first sight — by one who was unacquainted with it — was more likely to be referred to the *noctuidae* than to the *tineidæ*. And I am yet of that opinion. There is something in the size, form, and color, especially of the darker species of *Anaphora*, that "at first sight" is much more suggestive of the *noctuidae* than it is even of the true *tineidae*, to which examination shows that it belongs: and if there is anything about *Anaphora* that "at first sight," or "second sight" either, shows it to belong to any other section of *tineidae* than that which contains *Tinea* proper, I don't know what it is. If there is anything under the sun about *Anaphora*, or for that matter about a true *Tinea*, say *T. tapetzella*, which at first sight, or upon the most careful examination, suggests that it is more closely allied to *Gracilaria*, *Lithocolletis*, *Gelechia*, *Cemiostoma*, or any of the host of smaller *tineidae* than it is to *Noctua*, I have failed to detect it, and if no resource was left to me but to either place *Anaphora* in *noctuidae*, or in the same family with *Phyllocnistis* or any of the genera of smaller moths known to me, then I should unhesitatingly refer *Anaphora* to the *noctuidae*. *Anaphora* no doubt belongs to the *tineidae*, restricted to the allies of *Tinea* by Mr. Stainton in his Insecta Britannica, v. 3, but neither Lord Walsingham nor Mr. Grote uses the name *tineidae* in this sense in the papers above quoted. Both, in the papers in *Papilio* above mentioned, have discarded even Stephens' distinction between *tineidae* and *hyponomeutidae*, and include under the name *tineidae* all or nearly all of the genera included by Stephens in both of his families, with some others not mentioned by him, thus placing *Cemiostoma*, *Nepticula*, *Tischeria*, *Phyllocnistis*, *Aspidisca*, *Heliodines*, *Lithocolletis*, *Gracilaria*,

Gelechia, and a host of other genera, so numerous that time fails me to mention them, possessing among themselves the most varied structure and metamorphoses, along-side of *Anaphora*, *Tinea*, *Exapate Ochsenheimeria*, &c., as genera of equal value in the same family, the *tineidae!*

Lord Walsingham does indeed, in *Papilio*, refer to certain sub-groups of the family *tineidae*, but still he evidently considers them minor groups and looks upon the *tineidae* as a homogeneous group or family in the same sense with *noctuidae* or *geometridae*. To my view it (the *tineidae* of these authors) is about as heterogeneous a group of moths as that would be which should contain the *bombycidae*, *noctuidae*, *geometridae*, *tortricidae* and *pyralidae* thrown into one: the species or genera comprised in it have no unity of structure, habit, metamorphosis, life-history, habitat, or ornamentation, and a family which comprises the genera referred to above (and others equally heterogeneous) might just as consistently contain all lepidoptera heterocera at once: it would then scarcely be more mixed that it is now. I don't like to dissent from such able and distinguished entomologists as Lord Walsingham and Mr. Grote, but truth is better even than good company.

I have stated elsewhere that I thought Stephens' classification of the *tineidae* thoroughly vicious. This language is too strong. I will say rather that I think his classification radically bad in so much as it gives too much weight to the presence of both pairs of palpi, and their size — it is too much a palpal classification — not consistently carried out, and one which it seems to me impossible to carry out consistently. Still it was a step in the right direction, and infinitely better than the arrangement which places all of the genera known to Stephens and many others in a single family. The objection to Stephens' arrangement is that it does not recognise families enough, and my objection to Mr. Stainton's classification is that it recognises perhaps too many. Mr. Stainton's *tineidae* (restricted) seems to be a good and natural family of equal or nearly equal value with the *noctuidae*, but his *gracilaridae* and *lithocolletidae*, together with *Phyllocnistis*, instead of forming two families and part of a third, form together a single, well defined family. The structure and metamorphoses of the larvae and pupae seem to me to separate these moths from all of the known *tineidae*, and to unite them in a single natural group having family characters more than usually well marked. Whether the structure of their larvae and pupae are the result of evolution from some lower form, or of degradation from some higher one, that evolution or degradation has evidently been along the same lines in all of the genera included in the group, and shows a near relationship between them as well as a different development from anything that is known elsewhere among lepidoptera: for the course of development from the egg to the imago is different entirely from that of all the other groups of the order, and the eggs themselves are of different shape, size and consistency from those of all the other small moths known to me. They form, therefore, in my opinion, a family at least as dis-

tinct and well limited as the true *tineidae* or even more so. The *nepticulidae* seem to me to form another natural family. The immense host comprised in Mr. Stainton's families *hyponomeutidae*, *gelechidae*, *glyphipterygidae*, *coleophoridae*, form at least one other family, if not more than one, though I incline to include the last three, at all events, in a single family. A large number of genera of his family *elachistidae* may probably be included in the *gelechidae*, but there will still remain many of the others which are difficult of location, unless each of them shall itself be held of family rather than of generic value. Thus *Tischeria* seems to me especially to stand alone. Mr. Stainton places it in *elachistidae*; Dr. Clemens thought it belonged in *lithocolletidae*, an opinion in which I also was at one time inclined to concur, when looking only to some of the characters of the imago: but those of both larva and imago separate it *toto coelo* from *lithocolletidae*, and those of the larva separate it from all other lepidoptera: its labrum and maxillae are as much like those of some coleoptera. *Cemiostoma* also is *sui generis* or rather *sui familiae*. Mr. Grote rightly attaches much importance to the neuration of the wings, but, judged by this test, *Cemiostoma* seems to me to stand, if not alone, at least in no close relationship to any other genus. Our American species, *C. albella*, even differs from the European *C. laburnella*, as figured by Mr. Stainton in Insecta Britannica, v. 3, in that *albella* has the median vein of the primaries furcate at the base, as well as in other minor respects. The pupae are in some respects singular, and in the larva the structure of the trophi is as distinct and unique as it is in *Tischeria*. Mr. Stainton places *Cemiostoma* in his family *lyonetidae*, along with *Bucculatrix* (the affinities of which are rather with *Nepticula*) and *Phyllocnistis* (which I think belongs with *Coriscium* and *Lithocolletis*). In the same family he places *Lyonetia* and *Opostega*, the affinities of which are yet doubtful, the latter probably belonging near *Phyllocnistis*. It seems to me that this family (*lyonetidae*) cannot stand; and there still remain, especially among the lower genera of *elachistidae*, many forms as to the proper location of which I am not able to form an opinion. But with what sort of consistency and upon what scientific principles all of these multitudes of such diverse structure, metamorphosis, life-history, habitat, form and ornamentation, can be thrown into a single group, the equivalent of a single family of the higher heterocera, I cannot comprehend; but it seems to me — with the greatest deference for such authorities as Lord Walsingham and Mr. Grote— that in all of the particulars just enumerated, the insects associated by them under the common family name *tineidae* present family characters in variety as great as or even greater than all other heterocera combined.

Like Mr. Grote I do not desire any controversy on this subject, and have written above all that I desire to say or shall say upon it, and here take my farewell of it, hoping that nothing I have written will be considered to be in the least degree wanting in respect to either of the distinguished gentlemen abovenamed.

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CAPTURES OF FENISECA TARQUINIUS *Fabr.*

An example of this butterfly, which is generally regarded as a rarity by collectors, was captured at Center, N. Y., 25 May 1878, by Mr. O. von Meske—its first observation for this locality. It had been taken in two instances, many years ago, by Mr. Charles H. Peck, at Bath, near Albany, and had also been observed by him in Sandlake, N. Y., and Elizabethtown, N.Y., flying about bushes of alder (*Alnus serrulata* Ait.). Its appearance so early in the season seems to indicate two broods of the species—the second occurring, in the state of New York, during the first half of August. On the 1st day of August (1877) while riding at a brisk pace through the Raven Pass in Essex County, N. Y., en route to the Adirondack Mountains, a fresh example of the species was swept in my net, fortunately in hand, by Mr. Verplanck Colvin, from the back of one of the horses. This was but the third example that had come into my possession, and the first to display the delicate tracery of its under-wings in all its beauty. Subsequently, and during the two weeks following, several specimens (perhaps a dozen) were taken by Mr. E. L. Graef, of Brooklyn, L. I., at Beede's, head of Keene Valley. They were fluttering about the alders, upon which probably their eggs are deposited and their larvae feed. The locality would seem to be a particularly favorable one for them. The elevation of Beede's above tide water, as obtained from Mr. Colvin, superintendent of the Adirondack Survey, is 1240 feet [378 M.]. —*J. A. Lintner.*

PROCEEDINGS OF SOCIETIES.

ENTOMOLOGICAL SOCIETY OF LONDON.

17 JAN. 1883.—It was announced that the prize of £50, offered by Lord Walsingham, for the best essay on *Sclerostoma syngamus*, had been awarded to Dr Mégnin, of Paris (two competitors); no essay regarding *Strongylus pergracilis* had been received,

The following officers were elected:—President, J. W. Dunning; Treasurer, E. Saunders; Secretaries, E. A. Fitch and W. F. Kirby; Librarian, F. Grut.

5 FEB. 1883.—Mr. Billups exhibited an exotic orthopterous insect of the family *locustidae*, found living in a hot-house at Lee; it was strongly carnivorous in its habits.

Mr. Peringuey communicated notes on the habits of several South African species of *Paussus*, and especially in connection with their powers of crepitating, and carnivorous propensities.

7 MARCH 1883.—Dr. Sharp exhibited a dissection of the prosternum of an *Elater*, and called attention to the peculiar condition of the prothoracic stigma, which was closed by a perfect trap-door. He thought this arrangement might be useful in excluding parasites when the beetle was on its back after the manner of its kind.

2 MAY 1883.—This being the 50th anniversary of the foundation of the society, the President read a historical sketch, in which he succinctly embodied all points of interest concerning its career, and the benefits it had

conferred upon entomological science in general. Only six of the original members still survive, viz.: Prof. C. C. Babington, the Rev. L. Blomefield, Sir S. S. Saunders, Mr. W. B. Spence, Mr. G. R. Waterhouse, and Prof. Westwood. He expressed a hope that the number of members would be very largely increased before the end of the jubilee year. In concluding his address, he suggested that Prof. Westwood be elected titular Life-President of the society, accompanying his suggestion by eulogistic remarks on the career of our veteran entomologist, and his labors in the cause of entomology. This was adopted by acclamation.

The meeting was then made "special," in order to consider certain proposed alterations in the by-laws. Some of the propositions were adopted, others rejected. The chief resultant alterations were as follows:—No "subscribers" will be henceforth elected: the "Transactions" will be sent without further payment to all members not in arrear with their subscriptions: notice is to be given of names proposed to be substituted for those recommended for officers and council before the annual meeting, such proposed substitutions (if any) to be notified by circular to the members.—Selected from *Entomologist's mo. magazine.*

ZOOLOGICAL SOCIETY OF LONDON.

19 DEC. 1882.—Mr. Arthur G. Butler read a paper in which he gave an account of a collection of spiders made by the Rev. Deans Cowan in Madagascar. In addition to many interesting and singular forms were specimens of the curious tailed species, *Arachnoura scorpionides* from central Madagascar. Six new species were described.

5 JUNE 1883.—Mr. G. French Angas exhibited a collection of butterflies made during a recent visit to the island of Dominica. W. I.

A communication was read from the Rev. O. P. Cambridge on some new genera and species of spiders. Eight spiders, representing as many new genera, were described: two of them belonged to the family *theraphosidae*, one to the *drassidae*, and the others to the *thomisidae*. Three of these species were from Ceylon, three from Caffraria, one from New Zealand, and one from California.

A communication was read from Mr. Herbert Druce, containing descriptions of some new species of moths of the families *zygaenidae* and *arctiidae*, mostly collected in Ecquador, by Mr. C. Buckley. The number of new species described was fifty, belonging to twenty-four genera.

A paper was read by Messrs. Godman and Salvin, containing remarks on the variations of certain species of butterflies of the genus *Agrias*.—Selected from *Zool. anzeiger*, 1883. jahrg. 6.

LINNEAN SOCIETY OF NEW SOUTH WALES.

25 APRIL 1883. — Mr. Macleay exhibited specimens of a small moth (*tineidae*), the larva of which was at present creating great havoc in the vegetable gardens in and about Sidney, completely eating up the leaves of the cabbages and cauliflowers, and rendering the entire crop utterly useless. The caterpillar, a number of which were exhibited, is an active, slightly hairy, green worm, the pupa is also green and is fastened on the under side of the leaf on which it has fed, by a cocoon of beautiful open lace work. The rapidity with which this insect seems to reproduce itself is most astounding, and accounts for the short work it makes of a bed of cabbages. The insect was, it is said, first noticed last year, and then not in destructive numbers, so that it will probably be found to be an importation.

Professor Stevens exhibited a chrysalis of a *Danais*, secured by a silk line to a leaf of an exotic *Pelargonium*.—*Zool. anzeiger*, 9 July 1883, jahrg. 6. p. 376.

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Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard; S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

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Butlerow, A. Eine beobachtung mehr. (Deutscher bienenfreund. 15 March 1881. jahrg. 17, p. 81-83.)

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Packard in the western United States in the summer of 1877 [describing *bradynotes opimus*, *pezotettix pacificus* (fig.), *gomphocerus shastanus* (fig.), *circotettix maculatus* (fig.), *trimerotropis latifasciata*, *t. similis*, *t. caeruleipes*, *psinidia wallula* (fig.) = 8 n. spp., and figuring *melanoplus cinereus*, *m. devastator*, *m. atlanis*, *m. packardii*, *pezotettix borckii*, *camnula atrox*, *arphia frigida*, *trimerotropis vinculata*] (by S: H. Scudder), p. 23-28, pl. 17. *r*. App. 3: Report of John Marten [observations made in Iowa, Dakota, Minnesota and Nebraska, in 1879], p. 29-32. *s*. App. 4: Bibliography of some of the literature concerning destructive locusts [of Europe, Asia, and Africa (by B: P. Mann), with supplementary list (by Thomas)], p. 33-56. *t*. App. 5: Data concerning locusts in Texas [and in Indian Territory, in 1877] (furnished by A. J. Myer, from signal service records), p. 57-61. *u*. App. 6: On the flight of locusts [transl. by F. P. 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ENTOMOLOGICAL ITEMS.

THE SEVENTH congress of Russian naturalists and physicians will be held this year at Odessa, from 30 Aug. to 9 Sept.

DR. HAGEN notes in the April numero of the *Entomologist's mo. magazine*, that *Simulium*, the "black-fly," sucks out the juices of chrysalids of *Pieris menapia*.

THE FIRST numero of *Zoologische Beiträge*, a new German journal, contains a paper by Prof. Anton Schneider on the development of *Sphaerularia bombi*, the curious heminth parasitic in *Bombus*.

WILLIAM ALEXANDER FORBES, a rising English naturalist who has devoted much time to entomology, died at Shonga, on the upper Niger, Africa, on 14 Jan. 1883. He was born at Cheltenham, England, 24 June 1855.

FROM SEVERAL parts of Sweden the appearance of an unknown caterpillar, which consumes the crops, is reported. Its length is from one inch to one and a half, and its color grey-brown with green stripes. In one place it put in an appearance immediately after a violent storm with rain. The Academy of agriculture has despatched an entomologist to visit the places from which it is reported.—*Nature*, 5 July 1883, v. 28, p. 234.

PROF. PHILLIP CHRISTOPH ZELLER, of Grünhof, near Stettin, Germany, died at that place 27 March 1883. He was born 9 April 1808, at Steinheim-on-the-Mürr, in Württemberg. Prof. Zeller was a well-known authority on microlepidoptera, some of his papers dealing with those of North America. An interesting biography of Prof Zeller, by H. T. Stainton, is given in the *Entomologist's monthly magazine*, June 1883, v. 20, p. 1-8.

MR. EDMUND BAYNES REED has compiled a very convenient "General index to the thirteen annual reports of the Entomological society of the province of Ontario, 1870-1882" which has been published by the society. In a few instances the compiler, probably inadvertently, has used lower-case initial letters for generic names, and often lower-case letters for specific names derived from names of persons, mythological characters and places. A consistent and general use of lower-case initial letters, at least for species, would have been still more acceptable to the writer. Some errors in orthography and typography occur, but do not lessen the general usefulness of Mr. Reed's index. *G: D.*

M. FREDERICQ, of Liége, says the *English mechanic*, lately put several aquatic coleoptera (including the great water beetle) in aqueous solution of curare and strychnine in poisonous quantity. A few drops of these liquors sufficed to poison a frog in a few minutes. The insects, however, lived in them, some more than a fortnight, others nearly a month (when the experiment was concluded). These coleoptera are certainly sensible to the action of curare and strychnine, and the absence of symptoms of poisoning in the present case must be (the author says) because the absorption by the surface of the body and the mouth was *nil*. M. Plateau has previously observed that aquatic coleoptera kept in sea water do not absorb its salts.—*Amer. nat.*, Aug. 1883, v. 17, p. 903-904

IN THE *Bulletin of the Buffalo naturalists, field club* for March of the present year (1883), Prof. D. S. Kellicott, of Buffalo, describes and figures a remarkable larva which he has this year found parasitic upon and destroying nearly all of the galls of *Cecidomyia salicis-batatus* that had formerly abounded upon some low willows occupying waste land near the city. The larva was found to be a species of *Platygaster* belonging to the group known as that of the "cyclops larvae," from the great resemblance its larvae bear to the crustaceans of the genus *Cyclops*. The peculiar manner in which the five-jointed abdomen is folded underneath the body, like that of a cray-fish protecting her eggs, makes it a very interesting form.

We hope that Prof. Kellicott may soon be able to determine the species, if it be one that has already been described. *J. A. L.*

In a brief paper upon "Insects injurious to fruit," by Mrs. Mary Treat, read before the New Jersey state horticultural society, at its annual meeting in January last, among other items of interest, a statement was made of a remarkable collection of "cut-worms" by the writer, which may serve to show the value of the same method of dealing with these notorious pests, when employed upon a larger scale. Some phlox bordering a carriage-way through an orchard of dwarf pear trees was observed one morning to be partly denuded of its leaves and flower-buds. The cause being suspected, it was examined the following evening with a light, when "untold numbers of cut-worms were seen among the flower-buds." Numerous worms were at work on the branches of a plum tree beside them. A large number of worms were found eating into the just expanding buds of the pear-trees.

The soil around the phlox was examined, and the first collection resulted in over a pint of worms of various sizes. The best time for this search was found to be about dusk in the evening, for the worms were then just beneath the surface of the ground.

T. A. L.

SOCIETY MEETINGS.

The regular meetings of the Cambridge Entomological Club will be held at 7.45 p. m., on the days following:—

12 Oct. 1883.	14 Mar. 1884.
9 Nov. "	11 Apr. "
14 Dec. "	9 May "
11 Jan. 1884.	13 June "
8 Feb. "	

G. Dimmock, *Secretary.*

The New York Entomological Club meets twice monthly, except in June, July and August, but no special date is fixed for each meeting.

Henry Edwards. *Secretary.*

The regular meetings of the Entomological Section of the Boston Society of Natural History will be held at N. W. corner of Berkeley and Boylston Sts., Boston, Mass., at 7.45 p. m., on the days following:—

24 Oct. 1883.	27 Feb. 1884.
28 Nov. "	26 Mar. "
26 Dec. "	23 Apr. "
23 Jan. 1884.	28 May "

Edward Burgess, *Secretary.*

The regular meetings of the Entomological Section of the Academy of Natural Sciences, of Philadelphia, Pa., will be held at S. W. corner of 19th and Race Sts., on the days following:—

12 Oct. 1883.	14 Mar. 1884.
9 Nov. "	11 Apr. "
14 Dec. "	9 May "
11 Jan. 1884.	13 June "
8 Feb. "	

James H. Ridings. *Recorder.*

The semi-annual meetings of the American Entomological Society will be held at S. W. corner of 19th and Race Sts., Philadelphia, Pa., on the days following:—

10 Dec. 1883.	9 June 1884.

James H. Ridings. *Recording Secretary.*

The regular monthly meetings of the Montreal Branch of the Entomological Society of Ontario, will be held at Montreal, Que., Canada, on the days following:—

2 Oct. 1883.	5 Feb. 1884.
6 Nov. "	4 Mar. "
4 Dec. "	1 Apr. "
8 Jan. 1884.	6 May "

G. J. Bowles. *Secretary.*

The monthly meetings of the Brooklyn Entomological Society will be held in the rooms of Wright's Business College, Broadway, corner of Fourth Street, Brooklyn, E. D., the last Saturday of each month except July and August.

F. G. Schaupp, *Secretary.*

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PSYCHE,

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SEPTEMBER–OCTOBER 1883.

CONTENTS:

ADVERTISEMENTS 82
THE INFLUENCE OF METEOROLOGICAL CONDITIONS ON INSECT LIFE — *Charles Golding Barrett* [Abstract by *Benjamin Pickman Mann*] . . . 83–87
SALIVARY GLANDS IN BEES — [Abstract by *George Dimmock*] 87–89
CONTRIBUTION TO THE KNOWLEDGE OF PARASITIC LIFE IN GALLS — [Abstract by *Benjamin Pickman Mann*] 89–91
PROCEEDINGS OF SOCIETIES. — Linnean Society of London 92–93
LONDON LETTER — *W. L. Distant* 93–94
VACTOR TOUSEY CHAMBERS 94
BIBLIOGRAPHICAL RECORD, no. 3292–3337 95–98
ENTOMOLOGICAL ITEMS — Society Meetings 99–100

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S. H. SCUDDER,
Cambridge, Mass.

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The undersigned is desirous of obtaining, by exchange or otherwise, specimens of as many species of the COCCIDAE as possible, for the purpose of making a study of the North American forms. Those found infesting cultivated plants especially desired. Living specimens preferred when they can be obtained.

J. HENRY COMSTOCK,
Department of Entomology,
The Cornell University,
Ithaca, N. Y.

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The undersigned desires, either by exchange or otherwise, Galls from all parts of the United States. He is especially interested in those made by *Lepidoptera, Coleoptera, Homoptera and Diptera.* Correspondence in reference to Gall growths, or other vegetable abnormities, is invited. CHARLES V. RILEY,
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Washington, D. C.

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PSYCHE.

THE INFLUENCE OF METEOROLOGICAL CONDITIONS ON INSECT LIFE.

BY CHARLES GOLDING BARRETT, PEMBROKE, WALES.

[Abstract, by B: Pickman Mann, Washington, D. C., from Entom. mo. mag., June 1882, v. 19, p. 1-8.]

"The means employed by nature to keep species within due bounds—checking their inordinate increase or unnecessary decrease—are so certain and reliable in their results, and yet so obscure and difficult to trace in their modes of action, that almost any observations, however slight, which seem to be reliable as data from which to ascertain these means, are interesting and worthy of being put on record.

"In every district and every climate there are evidently many species so peculiarly fitted to it that none of the periodical changes of weather and temperature materially affect their numbers, and from *these* little evidence can be obtained. It is from those species which only casually and rarely extend themselves from their natural homes into climates unsuitable for them, or from those which are always to be found in a given locality, but sometimes rarely and always varying in numbers, that the most satisfactory evidence must be expected.

"In the first class of cases an example occurred to me a few years ago which seems very much to the point."

From eggs of *Deiopeia pulchella* received from the south of France some moths were, by great care and assiduity, reared to maturity in England, and from these were obtained fertile eggs, which duly hatched. Only about half a dozen of the larvae seemed to possess sufficient vitality to feed. These were fed on potted plants, grown in a sunny window, where they, covered with gauze, "grew rapidly, feeding with especial eagerness when the sun was shining on them. The weather happened to be fine and the sun hot for two or three weeks just at that time, and one larva made such progress that in a fortnight it was full-fed, when it spun a very slight cocoon on the gauze and turned safely to pupa. By this time two more larvae were full-fed and left the food-plant for the gauze, the rest being fully half-grown, when a change of weather came, with wind, heavy rain, and a total absence of sunshine. The larvae were, of course, not exposed to the rain, but the effect of the change was that those full-fed made no attempt to spin up, and the rest ceased to feed, and in a few days they all fell off the gauze or the plants, dead. After a fortnight of wet weather it cleared up and the one pupa produced the moth—a male.

"This seems to supply a key to the whole history of the eccentric casual appearances" in England, "of this and many other inhabitants of warmer climates. In obedience to some singular instinct that impels insects when becoming too numerous in their natural homes to emigrate to 'fresh fields and

pastures new,' they, contrary to their ordinary habits, cross land or sea, arriving, of course, very often, in some inhospitable clime, where — if not at once captured — they very likely soon fall victims to some pitiless storm of wind and rain. But supposing both these risks to be avoided, the moth — if an impregnated female — in due course lays its eggs, which most probably hatch. If the temperature happens to be lower or the weather wetter than the natural constitution of the species is able to endure, the young larvae die without even attempting to feed, but if matters are more favourable, the strongest of them struggle along, and if fairly favoured by the weather a few of them may reach the perfect state; if quite unusually favored by the weather a large proportion of them may do so, producing those remarkable instances of the sudden appearance in numbers of a species usually rare. Such good fortune rarely extends to a second season and the species becomes a rarity again or is even probably exterminated, to be renewed at some future time by the same instinct of migration. In cases such as these it appears to me that sunshine means life, and its absence destruction, to the larvae, and that by this simple and obvious influence the extension of species beyond their assigned limits is practically prohibited.

"It also happens sometimes that the immigrant, following instinctively its inherited habit, attempts to produce *an additional brood* in the year, over what the climate will allow." For instance, pupae of the second brood of *Colias edusa*, in England, showed in December the yellow color of the wings, "which only shows itself when the insect is nearly ready to emerge," thus "following inherited habit so as to hibernate, as they are well known to do [on the continent of Europe] in the perfect state, but from insufficient warmth and sunshine were unable to muster sufficient strength," and died.

Again, in the autumn of 1880, in which year there had been a wonderful immigration of *Vanessa cardui* into England, evidently a portion of the vast army that migrated across Europe, larvae were found tolerably common, feeding, at the beginning of October, on young thistle plants, close to the ground, making their nests among the radical leaves, all the tall thistles being dead. From some of these larvae two pupae were obtained, in doors, 17 and 20 October, and one imago, 20 November. "The rest died. This failure of instinct on the part of the immigrants surely explains, in some degree, the fact that last year [1881] the insect was more than usually scarce, hardly any appearing to have hibernated, and also why an insect with such power of increase in a suitable climate is so uncertain and variable in its appearances in one that is unfavorable.

"With reference to the second class of cases — those in which a species always present is periodically common or scarce — much has been written, excessive *rain* being usually assigned as the cause of diminution in numbers, sunshine as the cause of increase. Without doubt these causes act to a

very large extent, large numbers of larvae being actually *drowned* by continued heavy rain, and others rendered liable to disease, but a little evidence has come under my notice, pointing so distinctly to another influence of equal potency, that I think it well worth recording in detail."

For many years previous to 1878 there had been little or no intense cold in Pembrokeshire, owing to the predominance "through each winter of winds from the southeast, south and west, and especially the southwest, all coming off a sea kept constantly warm by the gulf stream. In many places fuchsias standing out of doors had never been cut down by frost within the memory of the inhabitants." Some of these plants had become trees five or six metres high, with trunks of the size of a man's leg. Plants usually grown in greenhouses here flourished in the open air. "During these years, very many insects of general distribution [in Great Britain] continued to be either very scarce, or confined to exceedingly restricted localities in this district." [Particulars given.] "*Noctuae* (except a few universally abundant species) appeared to be almost absent; such a dearth of ordinary night-flying species I never knew anywhere before.

"But in the winter of 1878, there was a great change. Persistent north or northeast winds, intensely cold, froze everything up hard, the warm sea air was completely expelled, or if a slight change of wind permitted a few clouds to come over, the rain from them was instantly converted into ice, with which the high roads were coated to a thickness of three or four inches [7.6 to 10.2 cm.], for weeks.

"The winters of 1879 and 1880 were equally cold, indeed, the latter was said to be the coldest known here for fifty years, even the sea sands along the tide line were covered ankle deep with ice and frozen snow, a sight very rarely seen on this coast. The first of these three winters [1878-1879] killed all the shrubby veronicas and some of the sumachs, and the tree fuchsias and myrtles above the ground.

"And now I will give the results as regards insects."

Lepidoptera which before were exceedingly rare became more and more abundant in 1879, 1880, and 1881, until in the last year they actually abounded. Species previously restricted to a few favorite spots spread all along the coast or over the country. Many *Geometrae* turned up which had hardly been seen before.

"But in *Noctuae*, the improvement was the most remarkable, as in that group the scarcity had been most marked." [Mentions numerous species which became abundant.]

"Here we seem to have a direct example of cause and effect, but I am not prepared to say that the effect always arises in the same way. I think there can be no doubt that in the case of those insects, whose mode of life includes the capacity for hibernation, their constitution is greatly strengthened and their chance of arriving at maturity increased, if the cold of winter is sufficiently severe to induce *complete* tor-

pidity, undisturbed by warm and spring-like weather at unseasonable times, and this may account for the vast increase in numbers in species which hibernate in the egg state; it also probably has a strengthening effect on those which pass the winter as small social larvae under a silken tent on the ground, or which, like the *Noctuae*, hibernate in the larva state on the ground or among dead leaves, and are tempted out to feed by every warm and genial evening.

"On the other hand there can be no doubt that mild winters act directly to cause the destruction of both hibernating larvae and pupae, in two ways. One is by encouraging the growth of mould, which we know attacks them as soon as, from excess of rain or humidity, they become sickly; the other by permitting the continued activity of predaceous creatures. These are very numerous. Moles continue at work in mild winters, instead of burying themselves deep in the ground; and mice are constantly active. These small mammalia destroy great numbers of Lepidopterous pupae, and they abound in this district, as also do birds during the winter in an extraordinary degree. As soon as severe cold sets in to the north and east, the birds come down in swarms to the open fields and sheltered hillsides of this district, and it is hardly necessary to point them out as most industrious and persevering destroyers of larvae. Predaceous beetles and earwigs are generally on the alert all through very mild winters, and although they probably do not eat much at that time, and, indeed, are not very plentiful in Pembrokeshire, they must destroy many larvae and pupae, having little else to subsist upon. But I believe that the mischief done by all these added together does not equal that done by the Onisci.

"During mild winters these crustaceous vermin increase and multiply, and feed, and grow without check, till in so mild a climate they become a perfect nuisance, pervading everything indoors and out. It was hardly possible to keep them even out of the breeding cages, where they would get introduced when very small and unnoticed — or perhaps in the egg state — hunt out and destroy every larva and pupa, and grow large and plump without ever showing themselves above the leaves and rubbish. Doubtless, their industry out of doors was in the same proportion, and my impression is that they approached very near to completely exterminating many species that would naturally be common here. Severe cold seems to destroy some of them, for they are not nearly so numerous now, and it certainly puts a complete stop to their destructive operations during a time when larvae are most especially helpless and liable to attack. To this, with other causes already mentioned, I am inclined to attribute the extraordinary increase in numbers of so many species during the last three seasons, divided by severe winters. The winter now past has been mild, and, therefore, a further progressive increase cannot reasonably be expected; but I hope that the mischief done in one mild winter may not be

serious. It is the progressive increase of destroyers with the decrease of victims through successive mild seasons that is really to be dreaded.

"As a slight corroboration of this view, I may mention, that while this district of country is comparatively poor in all the species of which the larvae feed and hibernate in any exposed situation, several species of Noctuae, of which the larvae live underground, are always abundant, and the country is actually rather rich in those species of Tortricina which feed and hibernate entirely within the stalks or roots of plants.

"It is worthy of notice, that there are a very few species which have appeared unable to cope with severe cold. *Lobophora viretata* was tolerably common here during the first three or four years of which I have been writing, but after the first cold winter it became scarce, and has since almost disappeared."

SALIVARY GLANDS IN BEES.

[Abstract of a dissertation by Paulus Schiemenz.]

BY GEORGE DIMMOCK, CAMBRIDGE, MASS.

Paulus Schiemenz' dissertation "Über das herkommen des futtersaftes und die speicheldrüsen der biene" . . . [Rec., no. 3337] gives many interesting facts in the anatomy of the honey-bee and of other bees. The beginning of this paper is a historical consideration of the subject, with a description of the digestive tract of *Apis mellifica*, in which the author follows Plateau's view that the proventriculus serves to arrest the too rapid flow of the contents of the crop (or honey-stomach, as Schiemenz here terms it) into the ventricle. Following the views of Leuckart, in whose laboratory Schiemenz prepared this paper, the author considers that the ileum of the bees, as of insects in general, has no other function than that of furnishing a suitable connection between ventricle and rectum, and he decides that the nutrient fluid used by bees to feed their queen, larvae and drones surely does not come from the ventricle, as has been often supposed. The salivary glands are next described, and their secretions and histological structure discussed, in the order introduced for them by Siebold, i. e., as "system I, II, III, IV and V."

The gland of system I (Meckel's supramaxillary gland) is provided with a reservoir and discharges its strongly acid secretion by openings, one on each side of the "Schlundblättchen" [hypopharynx of Savigny]. This gland is absent in queens and drones. In six species of *Bombus* this system is well developed, and the author describes various modifications in other bees.

The glands of system II (Meckel's glandula sublingualis) are in the head, just above its lower or posterior chitinous walls, and are easiest prepared by first removing system I, and then the brain. The different efferent ducts of the parts

of this system of glands unite on each side, and the ducts resulting from their union join the duct from system III at right angles, forming a cruciform figure. The secretion of system II is slightly alkaline and leaves a fatty spot upon the test-paper. Queen bees have system II similar to that of workers, but in drones its place is occupied by a mass of yellow fat-cells, which cannot secrete and which the author follows Pagenstecher in regarding as results of degeneration. In the male of *Bombus* this system occupies nearly the whole head, while in the females and workers it is less developed proportionally than in *Apis*. System II is present in *Psithyrus*, *Megachile* and *Coelioxys*, but absent in all other bees examined by the author, e. g., in *Hylaeus*, *Dichroa*, *Dasypoda*, *Andrena*, *Osmia*, *Anthidium*, *Colletes*, *Melecta* and *Anthophora*.

System III consists of a pair of glands in the anterior part of the thorax, each gland having a reservoir, and each opening by a duct which passes forward into the head, the two ducts there uniting to form the common duct of this system, with which (as mentioned before) the two ducts of system II unite at right angles to form a cross, the combined efferent duct of systems II and III forming the fourth, or anterior, branch of the cross. The secretion of the glands of system III is slightly alkaline or neutral. In queens and drones, particularly in the latter, this system of glands is of similar structure, but not so strongly developed as in workers. The reservoir is differently proportioned in queen, drone and worker, but in the latter its capacity is greatest. System III is not as well developed, relatively, in other bees as it is in *Apis*. This system of glands is described and figured by Spaulding (Amer. nat., Feb. 1881, v. 15, p. 113-119), whom Schiemenz incorrectly cites as Hyatt, but whose description he rightly says "gives only the crudest outlines and even these inaccurately."

System IV, described minutely by Wolff and noticed by Graber, consists of two glands, one on each side, opening by a short duct upon the inner side of the base of each mandible, and giving out a strongly odorous and very acid liquid. If a mandible is torn from a bee's head the gland usually hangs to the base of the mandible as a little sac. In queen bees system IV is very strongly developed, in workers well developed, but has suffered a degeneration in drones, in which the gland, altho still present, secretes nothing. System IV is present, more or less developed, in all bees.

System V, which is not present in *Apis mellifica*, but exists in *Bombus* and some other genera, consists of an unpaired gland which opens into the outlet of the common duct of systems II and III. This system was not very fully studied by the author, its function probably being only that of lubrication.

In studying the development of these glands, which he considers at length, Schiemenz shows that systems I and IV are entirely new formations from epidermal invagination, system III is partly developed from the silk-glands of the larva, and systems II and V are derived later from the duct of system III.

While pursuing the development of these glands opportunity was taken of proving that Engelmann's so-called "neuroid filaments" (Neuroidfasern) were not of a neural nature.

Under the heading "function" Schiemenz treats of some curious views that have been advanced by authors in regard to the different salivary glands of bees. Ramdohr at first mistook system II for an olfactory organ and system III for its continuation in open communication with the tracheae of the thorax. He later corrected this error. Fischer thought that system III was an "insect-lung." Wolff and Graber properly receive sharp criticism at the hands of Schiemenz because they thought that system IV was a gland for moistening an olfactory organ beneath the labrum, the place where Wolff, in his wild search for analogies between vertebrates and insects, had located the olfactory organ of the bee. Schiemenz regards the glands of system IV as used in the preparation of food, and the glands of system I as producing, in part at least, the nutrient fluid used for the larvae. The functions of the other systems still remain doubtful.

As an appendix the author describes and figures the structures of the antennae of *Apis mellifica*, since it is now settled that the antennae are the seat of the olfactory sense.

CONTRIBUTION TO THE KNOWLEDGE OF PARASITIC LIFE IN GALLS.

[Translated, with some change, from G. Fr. Möllers "Bidrag till kännedomen om parasitlifvet i galläpplen och dylika bildninger" (Entom. tidskr., 1882, årg. 3, p. 182-186).]

BY B: PICKMAN MANN, WASHINGTON, D. C.

In his work, *Die ichneumonen der forstinsecten*, bd. 2, p. 217 and 219, Ratzeburg gives a list of all the parasites which Tischbein, Nördlinger, Reissig, and others had hatched from galls of species of *Cynips* and *Nematus*. Since however the list is very incomplete as regards our fauna I will here give a list of the parasites and inquilines which I have obtained from such gall-formations during several years' continuous investigations.

In the determination of the species I have followed exclusively Thomson's *Hymenoptera Scandinaviae* and *Opuscula entomologica*. Where the sex is not mentioned it is to be understood that both males and females were obtained, and where the quantity of specimens is not mentioned that a moderate number were obtained: (a) indicates an abundance, (aa) a great adundance, and (r) a scarcity of specimens.

1. From galls of *Cynips folii*, collected in Scania, September 1868, were raised, in March 1869: — *Torymus viridissimus* (r), *T. cingulatus*, *T. flavipes* ♀ (unique); in April: — *Synergus vulgaris;* in May: — *Eurytoma appendigaster* ♀ (unique).

2. From galls of *Cynips longiventris*, collected in Scania, September

1875, were raised, in May 1876:— *Torymus nigricornis* ♀ (unique), *Syntomaspis cyanea*, *Synergus nervosus* (a), *Platytermus fasciculatus*, *Decatoma biguttata* ♀ (r).

3. From galls of *Cynips terminalis*, collected in Blekinge, July 1876, were raised, in July 1876:— *Torymus viridissimus* (a), *Synergus facialis*, *Decatoma biguttata* ♀, *Torymus euchlorus* (r), *T. cingulatus* ♀ (unique), *Platytermus simplex* (r), *Cecidostiba truncata* (r), *Megastigmus dorsalis* ♂ (unique); in February and March 1877:— *Olinx gallarum* (aa); in March:— *Syntomaspis saphirina* (a), *Megastigmus dorsalis* (r); in May:— *Eupelmus urozonus* (r), *Cecidostiba rugifrons*.

4. From galls of *Cynips terminalis* from Öland, collected in September 1876, were raised, in February to April 1877:— *Syntomaspis saphirina* (aa); in March:— *Pimpla inanis* ♂ (r); in April to July:— *Megastigmus dorsalis;* in April:— *Synergus nervosus* (a), *Tortrix* (?*Grapholitha puncticostana*) (r), *Cecidostiba rugifrons*, larvae of *Balaninus villosus* (a), *Eurytoma intermedia;* in May:— *Eupelmus urozonus* (a), *Cecidomyia longicornis* ♂ (rather rare), *Cecidostiba truncata* (r), *C. collaris*, *Eupelmus azureus* (rather rare); in June:— *Tetrastichus terminalis* ♀.

Remark. The small lepidoptera and diptera which occur here, as well as the coleopterous larvae, are inquilines. The little *Pimpla* has probably been raised as a parasite upon the *tortricidae*, as also presumably the *Tetrastichus* from the *Cecidomyia*, analogously with its related genus *Oxymorpha*, which lives parasitically on *Cecidomyia fagi*. The *Eupelmus* have perhaps lived as parasites in the *Curculio*-larvae.

5. From galls of *Cynips gemmae*, from Scania, autumn of 1876, were raised, in March 1877:— *Synergus vulgaris* (a), *Olinx gallarum* (a), *Syntomaspis saphirina* (a).

6. From galls of *Cynips* (*Spathegaster*) *baccarum*, collected in Scania during April and May 1876-1879, were raised, in May 1876:—*Synergus apicalis* (r), *Figites anthomyiarum* ♀ (unique); in June 1877:— *Torymus viridissimus* (a), *Amblymerus crassicornis* ♀ (rather rare), *A. pedunculi* ♀ (rather rare); in March 1879:— *Olinx fulvicrus* ♀; in April:— *Synergus thaumacerus* ♂ (unique); in July:— *Torymus viridissimus* (a), *Eutelus heterotomus* ♂ (unique), *E. collaris*, *Synergus vulgaris* (a), *Platytermus fasciculatus* ♀ (r), *Ormyrus gastris* ♂ (common) ♀ (r).

7. From galls of *Cynips* (*Trigonaspis*) *crustalis*, collected in Scania, April 1878 and 1879, were raised, in June 1878:— *Synergus thaumacerus* (a); in April 1879:— *Syntomaspis fastuosa* (a); in July:—*Synergus thaumacerus*.

Remark. At the end of April 1878 quite numerous individuals of *Trigonaspis* of both sexes came forth, whenever *Synergus* exterminated *Syntomaspis;* in 1879 not a single *Trigonaspis* came forth whenever they were exterminated by *Syntomaspis*, whose para-

site *Synergus* was now present in small numbers.

8. From galls of *Cynips* (*Andricus*) *inflator*, from Scania, April 1877, were raised in the same month: — *Synergus* (*Sapholytus*) *connatus* ♀ (r).

9. From galls of *Cynips* (*Andricus*) *curvator*, collected in Scania, June 1879, were raised, in July 1879: — *Platytermus fasciculatus*.

10. From galls of *Cynips* (*Andricus*) *ramuli*, from Scania, June 1881, were raised, in July 1881: — *Olinx gallarum* (a), *Eutelus tibialis* ♀, *Decatoma incrassata* ♀ (unique).

11. From galls of *Cynips* (*Aulax*) *glechomae*, from Scania, were raised, in April 1882: — *Torymus glechomae* n. sp. ♀ (2 specimens).

12. From galls of *Cynips* (*Aulax*) *foveiger* on *Hieracium umbellatum*, were raised, in 1882: — *Decatoma submutica* (a).

13. From bedeguar galls [*Rhodites rosae*] on *Rosa canina*, collected in Scania during March 1881 and April 1882, were raised, in May to July 1881: — *Cynips* (*Rhodites*) *rosae* ♂ (r) ♀ (a), *Ortopelma luteolator* (a); in May and June: — *Habrocytus bedeguaris* (r); in June and July: — *Torymus bedeguaris* (r); in April to June 1882: — *Ortopelma luteolator* (a), *Torymus bedeguaris* (a); in May and June: — *Eurytoma pubicornis*, *Rhodites rosae* ♀ (r), *Aulax brandti* (aa).

14. From swelling on the branches of *Salix capraea*, collected near Stehag, in Scania, during March 1881 and April 1882, were raised, in May 1881: — *Nematus viduatus* (r), *Pimpla inanis* ♂ (r), *P. vesicaria* ♂ (common) ♀ (unique), *P. brevicornis*, *P. mandibularis* (r); in May and June, *Nematus pentandrae* (a); in June: — *Limneria chrysosticta* (aa), *Sympiezus sericeicornis* ♂ (unique); in June and July: — *Habrocytus capreae* (aa), *Eurytoma salicis* (a); in April 1882: — *Nematus pendandrae* (a); in April and May: — *Limneria chrysosticta* (a); in May and June: — *Eurytoma salicis* (a), *Habrocytus capreae* (r).

A part of the species of the genus *Torymus* and of the genera *Syntomaspis* and *Megastigmus* are constant parasites in galls on oak, like *Ortopelma* and *Torymus bedeguaris* in rose-galls and *Limneria chrysosticta* in willow-galls. The genera *Synergus*, *Eurytoma* and *Decatoma* are all secondary parasites, that is to say, they attack in their turn the parasites on gall-formations and destroy them. The other *pteromalini* (*Eutelus*, *Platytermus*, *Habrocytus*, etc.) are probably also secondary parasites. In regard to *Aulax brandti*, on the other hand, which often occurs so numerously in bedeguars, it can hardly be considered as a parasite, since all its congeners form gall-like swellings on the branches of plants or live in swollen seed-capsules, but it may be considered to be an inquiline or the possible fellow-builder with *Rhodites rosae*. The *Pimpla* raised from willow galls of the year 1881 have probably all lived parasitically on the larger *Nematus viduatus*.

PSYCHE.

CAMBRIDGE, MASS., SEPT.-OCT., 1883.

Communications, exchanges and editors' copies should be addressed to EDITORS OF PSYCHE, *Cambridge, Mass. Communications for publication in* PSYCHE *must be properly authenticated, and no anonymous articles will be published.*

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PROCEEDINGS OF SOCIETIES.

LINNEAN SOCIETY OF LONDON.

15 FEB. 1883.—Mr. J. Jenner Weir exhibited a perfect hermaphrodite butterfly (*Lycaena icarus,*) and a blue male and a brown female of the same species for comparison. The hermaphrodite in question possesses two spotless blue wings on the left, and two spotless brown wings on the right, thus being intermediate in color between the two sexes.

A paper was read on the manna insect of South Australia, by J. G. Otto Tepper. This contains observations on the insect in question, and on the peculiar saccharine substance derived from and deposited on various species of *Eucalyptus* trees.

1 MARCH 1883.—Mr. Alfred W. Bennett read a paper "On the constancy of insects in their visits to flowers." He stated as a summary that the different classes of insects show very great difference in this respect. Butterflies show but little constancy except in a few instances; but they would appear to be guided to a certain extent by a preference for particular colors. The diptera exhibit greater constancy, though by no means absolute. A much greater degree of constancy is manifested by the *apidae*; and this becomes all but absolute in the hive-bee. It is an interesting circumstance that this constancy appears to increase in proportion to the part performed by the insects in carrying pollen from flower to flower. A much larger number of observations is however needed in order to determine with certainty any general law; and especially a careful microscopic examination of the pollen attached to the proboscis, mandibles, legs, and under side of the abdomen and thorax. As respects preference for particular colors, the lepidoptera observed paid 70 visits to red or pink flowers, 5 to blue, 15 to yellow, 5 to white; the diptera 9 to red or pink, 8 to yellow, 20 to white; the hymenoptera 303 to red or pink, 126 to blue, 11 to yellow, 17 to white.

There followed a communication "On the methodic habits of insects when visiting flowers" by Mr. R. M. Christy. The author records in detail the movements of 76 insects while engaged in visiting 2,400 flowers. He tabulates the results and concludes that insects possess a decided preference for a number of successive visits to the same species of flower, although this is not invariably the case. Most of the observations were made on bees, which seem to perform the fertilization of at least one-half of all the flowers fertilized by insects in this country. Butterflies as a rule seem to wander purposelessly in their flight, nevertheless some species, including the fritillaries, are fairly methodic. The author believes that it is not by color alone that insects are guided from one flower to another of the same species, and the sense of smell is suggested. Bees, he avers, have poor sight for long distances but good sight for short distances. Of 55 humble-bees watched, 26 visited blue flowers; 12 of the bees were methodic in their visits and 5 not so: 13 visited white flowers; 5 were methodic and 8 not so: 11 visited yellow flowers; 5 were methodic and 6 not so: 28 visited red flowers; 7 were methodic, 9 nearly so, and 12 not so. Mr. Christy inclines to the opinion (though admitting paucity of data) that bees in a

flight from their nest confine their visits exclusively or principally to only one species of plant.

15 MARCH 1883.—Prof. T. S. Cobbold read a paper "On *Simondsia paradoxa* and on its probable affinity with *Sphaerularia bombi*."

19 APRIL 1883.—Rev. A. E. Eaton gave a digest of an extensive monograph of the *ephemeridae*, or mayflies, Part 1. In this the subject is prefaced by the historical accounts, and his views of the group generally; the genera are defined, and a tabular conspectus of the present known species indicated.

7 JUNE 1883.—A short record of observations on the white ants (termites) of Rangoon, by Dr. Robert Romanis, was read by the secretary. He details what he saw in what may be termed the swarming of a nest. —Selected from *Zool. anzeiger*.

LONDON LETTER.

EAST DULWICH, LONDON,
JULY 6th, 1883.

Perhaps the most interesting information to American entomologists is that relating to the progress of Godman and Salvin's great work—the "Biologia Centrali-Americana." This has now appeared with most commendable punctuality during the last three years, and the following is an abstract of its progress to date.

Subjects.	Authors.	Nr. of species enumerated.	New species described.	New genera described.	Nr. of Plates.	Nr. of species figured.	Number of figures.	Pages letter-press.
COLEOPTERA:								
Adephaga	H. W. Bates	812	240	7	7	175	175	216
"	D. Sharp	417	282	27	4	66	66	192
Serricornia	C.O.Waterhouse	88	36	1	2	40	40	32
Malacodermata	H. S. Gorham	498	295	13	9	208	221	192
Longicornia	H. W. Bates	837	276	24	15	258	269	224
Phytophaga	M. Jacoby	736	243	2	15	350	374	264
LEPIDOPTERA:								
Rhopalocera	Godman & Salvin	405	29	7	26	222	404	264
Heterocera	H. Druce.	90	5	—	2	14	15	24
RHYNCHOTA:								
Heteroptera	W. L. Distant	574	134	9	21	464	513	232
Homoptera	W. L. Distant	56	20	—	3	42	42	24

To this may be added the first hymenopteral contribution of Mr. P. Cameron, which has just appeared. This fauna includes the whole of Mexico and extends as far south as the Isthmus of Darien. Some idea as to the extent of the work remaining to be completed can be gathered from observing the many families and some orders of insects which have not as yet been commenced. My own contribution devoted to the rhynchota has only just reached the *capsidae*, but it has already dealt with some matters of interest to Nearctic entomologists, such as the discovery of the "Chinch Bug," *Blissus leuco-*

pterus extending southward through Mexico, Guatemala and Panama.

Dr. Leitner, of Basle, has passed the last nine or ten months in this country, studying —both in the British Museum and at the different private collections — the polymorphism of lucanoid beetles comprised in the *odontolabidae*, with the view to an explanation of the evolution of the mandibles and of the strongly marked sexual dimorphism. Dr. Leitner considers the female to exhibit (in this case) the archaic type, and his memoir will probably be published by one of our London societies about the end of the year.

Perhaps at no previous period in the study of lepidoptera has so much complete faunistic work been in the course of publication as at the present time. Thus in your own country appears the excellent work of Edwards on the Butterflies of North America, whilst Godman and Salvin are publishing their monograph of the rhopalocera of Central America, and, farther south, Dr. Burmeister is doing a similar service for the lepidoptera of the Argentine Republic. In London Lang is publishing his "European Butterflies" whilst as regards the east, Moore's "Lepidoptera of Ceylon," Marshall and de Niceville's "Butterflies of India, Burmah and Ceylon," and my own "Rhopalocera Malayana" are regularly appearing and sufficiently attest the amount of publishing energy in this field.

Very few entomological collections have recently been received from the neotropical region. Mr. Champion has just returned from Central America bringing the remainder of the best collection — in view of the number of minute and carefully mounted specimens — ever made in the tropics. Dr. Angas has brought home from Dominica a small but interesting collection, and in all probability the next lot of entomological novelties from this region will be received in America from your countryman Herbert Smith and the other members of his expedition.

W. L. Distant.

VACTOR TOUSEY CHAMBERS.

Born in Burlington, Boone County, Kentucky, 6 August 1830.

Died in Covington, Kenton County, Kentucky, 7 August 1883.

Mr. Chambers made his name familiar to the entomologists of North America, and widely abroad, by his writings upon the *tineina*, and may be reckoned next to Brackenridge Clemens as a pioneer in the study of these insects in this country. His first paper upon the subject seems to have been his "A new species of *Cemiostoma*." . . . [Rec., no. 3297], published in June 1871, but we find an earlier paper of his on a parasited larva of *Tropaea luna*, published in January 1870. His last paper appears to be his "The classification of the *tineidae*," on p. 71-74 of the present volume of PSYCHE. Such of his papers as have thus far been recorded in PSYCHE appeared in approximately the following chronological order, the numerals referring to the Bibliographical record: 88, 411, 441, 337, 339, 340, 341, 343, 449, 361, 491, 1065, 1072, 1075, 1090, 1102, 1113, 1129, 1142, 1150, 1156, 851, 852, 853, 1185, 1196, 1212, 1239, 1244, 1261, 1398, 1866, 1868, 1867, 1292, 1308, 1326, 1409, 1370, 1805, 2269, 2803. We have still on hand the titles of several articles by him, making in all at least sixty titles, and many of these are in fact series of separate articles, appearing under the same word-title throughout a volume. Mr. Chambers was singularly unfortunate in the treatment he received from his proof-readers, in some of the publications where most of his articles appeared, and rendered the citation of his articles especially difficult by the similarity which he gave to their titles. A brief biographical sketch of him appears in *Science*, 24 Aug. 1883, v. 2, p. 253-254.

B: P. M.

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard: S: Samuel; T: Thomas: W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Bieler, S. [Pièces buccales d'un gamase uropode.] (Bull. Soc. vaudoise des sci. nat., Dec. 1880, s. 2, v. 17; Procès-verbaux, p. 8.).

Brief note on the trophi of a gamasid mite.
G: D. (3292)

Boden, C: J. *Pulex* feeding on lepidopterous larvae. (Entomologist, March 1882, v. 15, p. 70.)

Pulex irritans observed sucking the juices of larvae of *oecophora pseudospretella* and *endrosis fenestrella*.
G: D. (3293)

Borgmann, Hugo. Vorschläge zur präparation. (Entom. nachrichten, 1 Jan. 1881, jahrg. 7, p. 13–14.)

Discussion of proper length of insect pins, and of the height at which insects should be placed on the pins.
G: D. (3294)

Borgmann, Hugo. Zur anziehungskraft des lampenlichts auf nachtschmetterlinge und andere insecten. (Entom. nachrichten, 15 March 1881, jahrg. 7, p. 88–90.)

Gives formula for, and requests observations on the influence of elevation above sea-level, of temperature, hygroscopic condition, direction of the wind, condition of the weather, etc., on the attraction of insects by lights.
G: D. (3295)

Bowles, G: J: Entomology for beginners. Migratory insects. (Can. entom., July 1880, v. 12, p. 130–137.)

Notes on migrations of insects, especially of *calopteuus spretus. danais archippus* and *pyrameis cardui*.
G: D. (3296)

Chambers, Vactor Tousey. A new species of *cemiostoma. Micro-lepidoptera, tineina*. (Can. entom., June 1871, v. 3. p. 23-25.)

Describes *cemiostoma albella*, a new species, of which the larva mines the leaves of *populus alba* and *p. dilatata*.
G: D. (3297)

Cooke, E: Naphthaline. (Entomologist, Nov. 1882, v. 15, p. 263–264.)

Recommends use of naphthaline ($C_{10}H_8$) to keep mites out of collections.
G: D. (3298)

Corbett, H. H. The bad season for lepidoptera. (Entomologist, Oct. 1882, v. 15, p. 236.)

Limited number of species, but great number of individuals of a few species, of lepidoptera in England during 1882.
G: D. (3299)

Dalla Torre, K: W. Addenda et corrigenda zu Hagens Biblioth. entomolog., bis 1862. (Entom. nachrichten, 15 Dec. 1878, jahrg. 4. p. 324–330.)

Additions to and corrections of H. A. Hagen's "Bibliotheca entomologica" [Rec., 3306]. For continuation, see author's "Addenda und corrigenda" . . . (*op. cit.*, 1880, jahrg. 6) [Rec., 3301]," Addenda und corrigenda," . . . (*op. cit.*, 1 Feb. 1881, jahrg. 7, p. 45–48) [Rec., 3302], and "Addenda et corrigenda" . . . (*op. cit.*, 1 June 1881, jahrg. 7, p. 163–170) [Rec., 3303].
G: D. (3300)

Dalla Torre, K: W. Addenda und corrigenda zu Hagen's: Bibliotheca entomologica II. (Entom. nachrichten, 1880, jahrg. 6: 15 June, p. 125–129; 1 July, p. 137–140; 1 Aug., p. 168–171; 1 Dec., p. 261–267.)

Additions to and corrections of H. A. Hagen's "Bibliotheca entomologica" . . . [Rec., 3306], continued from author's "Addenda et corrigenda" . . . (*op. cit.*, 15 Dec. 1878, jahrg. 4, p. 324–330) [Rec., 3300], *which see*.
G: D. (3301)

Dalla Torre, K: W. Addenda und corrigenda zu Hagens Bibliotheca entomologica. III. (Entom. nachrichten, 1 Feb. 1881, jahrg. 7. p. 45–48.)

Additions to and corrections of H. A. Hagen's "Bibliotheca entomologica" . . . [Rec., 3306]. Continued from author's "Addenda und corrigenda" . . . (*op. cit.*, 1880, jahrg. 6) [Rec., 3301]; see also author's "Addenda et corrigenda" . . . (*op. cit.*, 15 Dec. 1878, jahrg. 4, p. 324–330) [Rec., 3300].
G: D. (3302)

Dalla Torre, K: W. Addenda et corrigenda zu Hagen's Bibliotheca er.tomologica. IV. (Entom. nachrichten, 1 June 1881, jahrg. 7, p. 163–170.)

Additions to and corrections of H. A. Hagen's "Bibliotheca entomologica" . . . [Rec., 3306]. Continued from author's "Addenda und corrigenda" . . . (*op. cit.*, 1 Feb. 1881, jahrg. 7, p. 45-48) [Rec., 3302]; see also author's "Addenda et corrigenda" . . . (*op. cit.*, 15 Dec. 1878, jahrg. 4, p. 324-330) [Rec., 3300].
G: D. (3303)

Dobson, H. T., *jr.* The effect of heat upon *notodonta dictaea*. (Entomologist, March 1882, v. 15, p. 65–67.)

Alteration of the normal time of appearance of *notodonta dictaea* by the season being milder or colder.
G: D. (3304)

Dobson, H. T., *jr.* Prevention of mould. (Entomologist, Nov. 1882, v. 15, p. 264.)

Effect of the use of carbolic acid in preventing mold in collections, and effect of cyanizing on some lepidoptera. *G: D.* (3305)

Hagen, Hermann August. Bibliotheca entomologica. Die litteratur über das ganze gebiet der entomologie bis zum jahre 1862. 2 v. Lpz., *W. Engelmann*, 1862–1863. Bd. 1. A-M, 1862. t.-p., 12+566 p. Bd. 2. N–Z. Mit einem systematischen sachregister. t.-p. + 512 p., 24 × 15, t 18.2 × 11.

Additions and corrections, by K: W. Dalla Torre, entitled "Addenda et corrigenda zu Hagens Biblioth. entomolog., bis 1862." (Entom. nachrichten, 15 Dec. 1878, jahrg. 4, p. 324–330.)

Additions and corrections, by K: W. Dalla Torre, entitled "Addenda und corrigenda zu Hagen's: Bibliotheca entomologica II." (Entom. nachrichten, 1880, jahrg. 6: 15 June, p. 125–129; 1 July, p. 137–140; 1 Aug., p. 168–171; 1 Dec., p. 261–267.)

Additions and corrections, by K: W. Dalla Torre, entitled "Addenda und corrigenda zu Hagens Bibliotheca entomologica. III." (Entom. nachrichten, 1 Feb. 1881, jahrg. 7, p. 45–48.)

Additions and corrections, by K: W. Dalla Torre, entitled "Addenda et corrigenda zu Hagen's Bibliotheca entomologica. IV. (Entom. nachrichten, 1 June 1881, jahrg. 7, p. 163–170.)

Bibliography of 18130 writings on entomology, besides extracts, reviews, and translations, by 4766 named and 851 anonymous authors, from the earliest times down to the year 1862, with designation, as a guarantee of accuracy, of the 14334 titles transcribed from the works themselves by the author, and with a minutely analytical subject index; list of 19 entomological societies, and of the entomological publications of 11 societies; description of the author's methods, and discussion of the principles of construction of the bibliography. *B: P. M.* (3306)

Riley, C: Valentine. The boll-worm alias corn-worm. *Heliothis armigera* Hübn. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 145-149, pl. 1; pl. 12, fig. 1.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 145-149 [85-89], pl. 1; pl. 12, fig. 1.)

Advance reprint, from 4th report of U. S. entomological commission, of section on the food-plants of *heliothis armigera*, other than cotton; list of these food-plants, and of authorities upon which the respective statements are made; history of first proofs of the identity of this species on maize with the same on cotton; habits of the larvae in their several broods; figures of all stages of the insect. *B: P. M.* (3307)

Riley, C: Valentine. The catalpa sphinx. *Sphinx catalpae* Boisd. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 189-193, pl. 13.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 189-193 [129-133], pl. 13.)

Relative excellence of *catalpa speciosa* and *c. bignonioides* as timber-trees, according to J: A. Warder; geographical distribution, habits, ravages and parasites of and means against *sphinx catalpae;* description and figures of all stages of this insect; description of supposed sound-producing organs in pupae of this and other species. *B: P. M.* (3308)

Riley, C: Valentine. The clover leaf-beetle. *Phytonomus punctatus* Fabr. (Rept. [U. S.] commiss. agric., for 1881 and 1882 [Jan. 1883], p. 171-179, pl. 10, fig. 1.) (RILEY, C: V. Report of the entomologist . . . . [1 Dec.] 1882, p. 171-179 [111-119], pl. 10, fig. 1.)

Food-plants and habits of the species of *phytonomus* in Europe and United States; civil and natural history, number of annual broods, ravages, enemies and geographical distribution of and means against *ph. punctatus*; description and figures of eggs, larva (four stages) and pupa of this species; figures of imago and of injured plant; report, by E. A. Schwarz, of observations on this insect in New York; *hylesinus trifolii* seems to feed only on *trifolium pratense;* coleoptera imported from Europe usually confined to the neighborhood of the Atlantic coast. *B: P. M.* (3309)

Riley, C: Valentine. The corn bill-bug. *Sphenophorus robustus* Horn. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 138-142, pl. 7, fig. 2; pl. 8, fig. 2.) (RILEY, C: V. Report of the entomologist . . . . [1 Dec.] 1882, p. 138-142 [78-82], pl. 7, fig. 2; pl. 8, fig. 2.)

History of earlier observations on the species of *sphenophorus* injurious to maize in the United States; report of observations on *s. robustus*, by L. O. Howard; habits and ravages of *s. robustus;* description and figure of larva, pupa and imago of this species and description of larvae of *rhodobaenus tredecimpunctatus* and *rhynchophorus zimmermanni*, and figures of imago of the former; characters distinguishing *sphenophorus* and *s. robustus* and the four other species allied to it from other genera and species. *B: P. M.* (3310)

Riley, C: Valentine. *Crambus vulgivagellus*. (Amer. nat., Nov. 1881, v. 15, p. 914-915.)

Records the excessive abundance of this species in the eastern United States in 1881; description of the egg; method of oviposition. *B: P. M.* (3311)

[**Riley**, C: Valentine.] A disastrous sheep parasite. (Amer. nat., Dec. 1881, v. 15, p. 1011.)

A parasite, probably *trichodectes ovis*, doing great injury to sheep in Illinois. *G: D.* (3312)

[**Riley**, C: Valentine.] [*Dolerus unicolor*.] (Amer. nat., July 1881, v. 15, p. 574.)

Statement, by H. Keenan, that the imagos of *dolerus unicolor* injured the fruit buds of pear-trees at Quaker City, Ohio, by eating holes therein; as this habit in a tenthredinid imago seems not to have been observed before, the statement is questioned. *B: P. M.* (3313)

Riley, C: Valentine. Effect of drought on the hessian fly. (Amer. nat., Nov. 1881, v. 15, p. 916.)

Hot and dry weather dries up and kills *cecidomyia destructor* and its parasites. *B: P. M.* (3314)

[**Riley**, C: Valentine.] Entomologist for the Pacific coast. (Amer. nat., Oct. 1881, v. 15, p. 821-822.]

Notice of attempts made to have a state entomologist appointed in California. *B: P. M.* (3315)

Riley, C: Valentine. Entomology in Buffalo, N. Y. (Amer. nat., Nov. 1881, v. 15, p. 917.)

Notice of v. 4, no. 1, of the Bulletin of the Buffalo society of natural sciences; list of entomological papers therein. *B: P. M.* (3316)

[**Riley**, C: Valentine.] Exuviation in flight. (Amer. nat., May 1881, v. 15, p. 395.)

Criticises R. McLachlan's observation that *oligoneura rhenana* casts its subimaginal skin while on the wing; describes the process in *polymitarcys alba;* excessive abundance of the latter species on the Red River of the North [Minnesota], in August 1877. *B: P. M.* (3317)

Riley, C: Valentine. Insect collection for sale. (Amer. nat., Dec. 1881, v. 15, p. 1014.)

Notice of the collection of coleoptera left by C: Trabrandt, of New Orleans, at his death. *B: P. M.* (3318)

Riley, C: Valentine. Insect enemies of the rice plant. (Amer. nat., Feb. 1881, v. 15, p. 148-149.)

Identifies *chalepus trachypygus* feeding on roots of the rice-plant, and conjectures that other mentioned enemies of rice may be *spalacopsis suffusa* and *centrinus concinnus*. Rice-plant in India injured by *cecidomyia oryzae*. *B: P. M.* (3319)

[**Riley**, C: Valentine.] Insect locomotion. (Amer. nat., Apr. 1881, v. 15, p. 325.)

Results of G. Carlet's studies on the order in which the feet are moved in the walking of hexapods and arachnids. *B: P. M.* (3320)

Riley, C: Valentine. Larval habits of *sphenophori* that attack corn. (Amer. nat., Nov. 1881, v. 15, p. 915-916.)

Mentions several species of *sphenophorus* injurious to maize plants in different parts of the U. S.; habits and ravages of *s. robustus*. *B: P. M.* (3321)

Riley, C: Valentine. Migration of butterflies. (Amer. nat., July 1881, v. 15, p. 577.)

Report, by J. H. Mellichamp, of the eastward flight of thousands of *pieris monuste*, in small groups of two, three or more individuals, on 1 and 2 June 1881, over Bluffton, S. C.; description of larva and pupa; larva feeds on *cleome pentaphylla* and *polanisia trachysperma*. *B: P. M.* (3322)

[**Riley**, C: Valentine.] Migration of plant lice from one plant to another. (Amer. nat., Oct. 1881, v. 15, p. 819-820.)

Exposition of J. Lichtenstein's theory that most *aphididae*, especially gall-making *pemphigini*, live upon two different plants in passing through their cycle of development; cites instances in which the host-plants are of different families. *B: P. M.* (3323)

[**Riley**, C: Valentine.] Moths mistaken for *aletia*. (Amer. nat., June 1881, v. 15, p. 486-487.)

Plathypena scabra and *phoberia atomaris* mistaken for *aletia argillacea;* hibernating habits of the first. *B: P. M.* (3324)

Riley, C: Valentine. The new imported clover enemy. (Amer. nat., Nov. 1881, v. 15, p. 912-914.)

Records occurrence and habits of *phytonomus punctatus*, injurious to *trifolium* in New York, describes the egg and larva of this species, and gives a list of food-plants of the European species of *phytonomus*. *B: P. M.* (3325)

[**Riley**, C: Valentine.] A new imported enemy to clover. (Amer. nat., Sept. 1881, v. 15, p. 750-751.)

Clover [*trifolium*] injured by *phytonomus punctatus* at Barrington, N. Y., in July 1881. *B: P. M.* (3326)

Riley, C: Valentine. A new rice stalk-borer: genus-grinding. (Amer. nat., Dec. 1882, v. 16, p. 1014-1015.)

Extract from author's "The rice stalk borer" ... (Rept. (U. S.) commiss. agric., for 1881 and 1882, 1882 [Jan. 1883] [Rec., 3332]), p. 134-135, with additional remarks; *chilo oryzaecellus* = *diphryx prolatella;* the genus *diphryx* stated by Lord Walsingham [T: de Grey] to have been founded by A: R. Grote on a mutilated specimen (as suspected by the author), with mistake of maxillary for labial palpi. *B: P. M.* (3327)

Riley, C: Valentine. A new species of oak coccid mistaken for a gall. (Amer. nat., June 1881, v. 15, p. 482.)

Description of *kermes galliformis* n. sp., occurring on *quercus palustris* in the southern and central U. S.; the coccid often infested by *euclemensia bassettella*.
B: P. M. (3328)

Riley, C: Valentine. The osage orange sphinx. *Sphinx kageni* Grote. (Rept. [U. S.] commiss. agric., for 1881 and 1881, 1882 [Jan. 1883], p. 193-194, pl. 12, fig. 2.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 193-194 [133-134], pl. 12, fig. 2.)

List of insects injurious to *maclura aurantiaca*; geographical distribution and classificatory relations of *sphinx kageni;* references to other accounts of this insect; description and figures of larva and imago.
B: P. M. (3329)

Riley, C: Valentine. Other insects injurious to growing rice. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 138, pl. 7, fig. 4-5.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 138 [78], pl. 7, fig. 4-5.)

Habits and food-plants of *laphygma frugiperda;* occurrence of certain other insects doing minor damage on rice plants. *B: P. M.* (3330)

Riley, C: Valentine. The rice grub. *Chalepus trachypygus* Burm. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 128-129, pl. 6, fig. 5.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 128-129 [68-69], pl. 6, fig. 5.)

Report of L. O. Howard on the habits and ravages of and means against *chalepus trachypygus;* references to earlier observations; structural characters and geographical distribution of the genera *cyclocephala* and *chalepus;* description and figure of larva and imago of *ch. trachypygus*. *B: P. M.* (3331)

Riley, C: Valentine. The rice stalk borer. *Chilo oryzaeellus*, n. sp. (Rept. [U. S.] commiss. agric., for 1881 and 1882 [Jan. 1883], p. 133-135, pl. 7, fig. 1) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 133-135 [73-75], p. 3 [167], pl. 7, fig. 1.)

Extract, with additions, by author, entitled "A new rice stalk-borer: genus grinding." (Amer. nat., Dec. 1882, v. 16, p. 1014-1015.)

Description and figures of larva, pupa and imago of *chilo oryzaeellus* n. sp. = *diphryx prolatella;* report of L. O. Howard upon its habits, enemies and ravages, and means against it; structural characters of the genus *diphryx* stated by Lord Walsingham [T: de Grey] (as suspected by author) to have been founded by A: R. Grote on a mutilated specimen, with mistake of maxillary for labial palpi. *B: P. M.* (3332)

Riley, C: Valentine. The urena anomis. *Anomis erosa* Hub. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 167-170, pl. 8, fig. 1.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 167-170 [107-110], pl. 8, fig. 1.)

Detailed comparison of eggs of *anomis erosa* and *aletia xylina;* figures and description of all states of the former species; seasons, habits and food-plants of this insect. *B: P. M.* (3333)

Riley, C: Valentine. The vagabond crambus. *Crambus vulgivagellus* Clem. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 179-183, p. 3, pl. 10, fig. 2.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 179-183 [119-123], p. [167], pl. 10, fig. 2.)

Civil and natural history of *crambus vulgivagellus;* habits, ravages and parasites of and means against this insect; description and figures of egg, larva and imago; figures of cocoons and injured grass; description of pupa; list of articles written concerning this insect; similarity of habits of *crambus warringtonellus* of England to habits of *c. vulgivagellus*. *B: P. M.* (3334)

Riley, C: Valentine. The "water-weevil" of the rice plant. (Amer. nat., June 1881, v. 15, p. 482-483.)

Extract, in author's "The water-weevil. *Lissorhoptrus simplex* Say." (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 130-133.) (RILEY, C: V. Report of the entomologist . . [1 Dec.] 1882, p. 130-133 [70-73].)

Remarks on the injury done to rice-plants by the larvae of *chalepus trachypygus*, and by other larvae formerly suspected to be those of *spalacopsis suffusa*, but now supposed, on the testimony of J: Screven, to be larvae of *lissorhoptrus simplex;* letter from J: Screven, embodying the above testimony; seasons, habits and ravages of the last mentioned species.
B: P. M. (3335)

Riley, C: Valentine. White blast. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 136-137.) (RILEY, C: V. Report of the entomologist . . . (1 Dec.] 1882, p. 136-137 [76-77].)

Letter from J: Screven and report from L. O. Howard on the phenomena and supposed causes of "white blast" in rice plants; insects found on rice plants; probable production of white blast by insects.
B: P. M. (3336)

Schiemenz, Paulus. Ueber das herkommen des futtersaftes und die speicheldrüsen der biene nebst einem anhange über das riechorgan. (Zeitsch. f. wissensch. zool., Feb. 1883, bd. 38, p. 71-135, pl. 5-7.)

Abstract by G: Dimmock, entitled, "Salivary glands in bees." (Psyche, Sept.-Oct. 1883, v. 4, p. 87-89.)

History of the subject; description of the salivary glands of *apis mellifica*, *bombus* and other bees, and of the digestive tract and olfactory organs of *a. mellifica;* discussion of the development and functions of the different salivary glands; decides that Engelmann's "neuroid filaments" are not of neural nature. *G: D.* (3337)

ENTOMOLOGICAL ITEMS.

DR. JAMES SPENCER BAILEY, of Albany, N. Y., a lepidopterist well known to many of our readers, died 1 July 1883. Dr. Bailey was born in Albany, N. Y., 25 Feb. 1830.

THE BRITISH association for the advancement of science met 19 Sept. and days following at Southport. The assembly of German naturalists and doctors took place 18-21 Sept. at Freiburg-in-Baden.

MR. TOWNEND GLOVER, for a long time entomologist of the United States government, died 8 September, at Baltimore, Md. He was of English parentage and education, but came to this country when a young man.

HOWARD AYRES won the first Walker prize for 1883, awarded by the Boston society of natural history, by the presentation of a paper on the development of *Oecanthus* and its parasite *Teleas*. One of the second Walker prizes was awarded to William Patton for a paper entitled "Notes on the development of *phryganidae*." Mr. Ayres and Mr. Patton were students of Harvard university and their success reflects much credit upon Dr. E. L. Mark, the present instructor in embryology at Harvard, who encourages his students to carry on original researches.

AT THE meeting of the French entomological society, held July 11, Mr. E, Lefèvre showed a large solitary ant allied to *Ponera*, found about Hong Kong, remarkable for the extraordinary development of its mouth parts, and for its power of leaping; being able, when disturbed, to make bounds of twenty to twenty-five centimetres. The statement was confirmed by the experience of earlier observers. As the legs are in no way developed for springing, Mr. Lefèvre was inclined to think that it was accomplished in some way by its buccal organs.—*Science*. 14 Sept. 1883, v. 2, p. 386.

DURING THE last few years *Papilio cresphontes* has been taken in Connecticut, but I do not find any record of its capture as far to the northeast as Cambridge, Mass. On 9 Aug. of this year I took a specimen of that species in Cambridge, and saw another 21 Aug. A few days later another was seen. On 21 Aug. I received a note from Mr. F. G. Sanborn announcing the capture on that day, by Mr. A. H. Newton, at Worcester, Mass., of a worn *P. cresphontes*. Another interesting capture which I made this year (25 July) in Cambridge was *Junonia coenia*. — *G: Dimmock*.

AMONG EXCHANGES lately received for PSYCHE special mention ought to be made of 33 books and pamphlets sent by the Colonial museum of New Zealand. Among these is a "Manual of the New Zealand coleoptera" by Captain Thomas Broun, containing 744 pages. Professor F. W. Hutton writes of it, before the publication of Part 2, in which the number of species reaches 1321, that it is "a most excellent work, containing 1050 species, a large part of which are described for the first time, and that no country outside Europe and the United States has produced such a catalogue." Another interesting paper is Professor Hutton's "Catalogues of the New Zealand diptera, orthoptera, hymenoptera; with descriptions of the species."

MR. F. H. SPRAGUE gives us the following notes upon rare diurnal lepidoptera which he has taken the past summer in Massachusetts. *Grapta faunus* (a pair), Leverett. 15 Aug. *Limenitis proserpina* (faded ♂), Holyoke, 8 Aug. *Argynnis atlantis* (several), Leverett, Mt. Tom, Mt. Holyoke. 7-17 Aug., appeared much earlier. *Euptoieta claudia*, Malden, a fine new ♂ each of the following dates: 17 and 27 July, 1 Aug., 7 Sept. *Junonia lavinia*. Malden, a fresh pair 21 July, one fresh specimen 21 Aug.; Jamaica Plain, a new ♂, 18 July; Boston, a new specimen, 18 Sept. *Limenitis arthemis*. Malden, a poor ♀, 1 Aug.; Amherst, 2 fair ♀, 7 Aug.; South Hadley, a new ♂, 7 Aug.; Deerfield, a new ♂, 17 Aug. *Feniseca tarquinius*, Leverett. 7 fair specimens, 10 Aug.; Deer-

field, 15 fair specimens, 17 Aug. *Vanessa milberti* has been abundant in some localities about Boston this season. Another rare capture was two partly grown larvae of *Citheronia regalis*, at Leverett, 15 Aug.

DR. HERMANN MÜLLER, of Lippstadt, Germany, who has made many interesting and valuable contributions to scientific literature upon the mutual relations of insects and plants, especially upon the fertilization of plants by insects, died at Prad, in Tyrol, 25 August. His name heads over fifty titles of the bibliographical record of volume three of PSYCHE, and the name of his brother, Dr. Fritz Müller, of Blumenau, Brazil, about twenty more. Dr. Hermann Müller has contributed largely to Just's *Botanischer jahresbericht*, to *Nature* and to *Kosmos*; and, among other separate works, may be noted his excellent treatise on the fertilization of flowers by insects and their mutual adaptation for that function. The above statements convey only an imperfect idea of the amount, and almost no idea of the value of the papers written by Dr. Müller, whose death will be mourned by his numerous correspondents and by naturalists in general as the loss of a true philosopher in his special field of research. *G: D.*

SOCIETY MEETINGS.

THE REGULAR meetings of the Cambridge Entomological Club will be held at 7.45 p. m., on the days following:—

12 Oct. 1883.	14 Mar. 1884.
9 Nov. "	11 Apr. "
14 Dec. "	9 May "
11 Jan. 1884.	13 June "
8 Feb. "	

G. DIMMOCK, *Secretary.*

THE NEW YORK Entomological Club meets twice monthly, except in June, July and August, but no special date is fixed for each meeting.

HENRY EDWARDS, *Secretary.*

THE REGULAR meetings of the Entomological Section of the Boston Society of Natural History will be held at N. W. corner of Berkeley and Boylston Sts., Boston, Mass., at 7.45 p. m., on the days following:—

24 Oct. 1883.	27 Feb. 1884.
28 Nov. "	26 Mar. "
26 Dec. "	23 Apr. "
23 Jan. 1884.	28 May "

EDWARD BURGESS, *Secretary.*

THE REGULAR meetings of the Entomological Section of the Academy of Natural Sciences, of Philadelphia, Pa., will be held at S. W. corner of 19th and Race Sts., on the days following:—

12 Oct. 1883.	14 Mar. 1884.
9 Nov. "	11 Apr. "
14 Dec. "	9 May "
11 Jan. 1884.	13 June "
8 Feb. "	

JAMES H. RIDINGS, *Recorder.*

THE SEMI-ANNUAL meetings of the American Entomological Society will be held at S. W. corner of 19th and Race Sts., Philadelphia, Pa., on the days following:—

10 Dec. 1883.	9 June 1884.

JAMES H. RIDINGS, *Recording Secretary.*

THE REGULAR monthly meetings of the Montreal Branch of the Entomological Society of Ontario, will be held at Montreal, Que., Canada, on the days following:—

2 Oct. 1883.	5 Feb. 1884.
6 Nov. "	4 Mar. "
4 Dec. "	1 Apr. "
8 Jan. 1884.	6 May "

G. J. BOWLES, *Secretary.*

THE MONTHLY meetings of the Brooklyn Entomological Society will be held in the rooms of Wright's Business College, Broadway, corner of Fourth Street, Brooklyn, E. D., the last Saturday of each month except July and August.

F. G. SCHAUPP, *Secretary.*

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Vol. 4. No. 115-116.

NOVEMBER-DECEMBER 1883.

CONTENTS:

ADVERTISEMENTS 102
A NEW SEXUAL CHARACTER IN THE PUPAE OF SOME LEPIDOPTERA—*Joseph Albert Lintner* 103-106
TRIBUTE TO THE MEMORY OF JOHN LAWRENCE LECONTE—*Charles Valentine Riley* 107-110
GILLS OF INSECT-LARVAE—*George Macloskie* 110-112
THE SCREW-WORM FLY, COMPSOMYIA MACELLARIA—*Samuel Wendell Williston* 112-114
INFLUENCE OF COLOR ON INSECTS 114
TOWNEND GLOVER 115-116
PROCEEDINGS OF SOCIETIES.—Cambridge Entomological Club 116
BIBLIOGRAPHICAL RECORD, no. 3338-3353 117-118
ENTOMOLOGICAL ITEMS—Society Meetings 119-120

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EARLY STAGES OF BUTTERFLIES WANTED.

The undersigned desires to obtain, by exchange or otherwise, from all parts of the world, eggs, caterpillars and chrysalids of Diurnal Lepidoptera. Dried specimens are preferred, especially of caterpillars, which should be prepared by inflation. Correspondence is invited with persons engaged in the study of the early stages of butterflies.

S. H. SCUDDER,
Cambridge, Mass.

COCCIDAE WANTED.

The undersigned is desirous of obtaining, by exchange or otherwise, specimens of as many species of the COCCIDAE as possible, for the purpose of making a study of the North American forms. Those found infesting cultivated plants especially desired. Living specimens preferred when they can be obtained.

J. HENRY COMSTOCK,
Department of Entomology,
The Cornell University,
Ithaca, N. Y.

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PSYCHE.

A NEW SEXUAL CHARACTER IN THE PUPAE OF SOME LEPIDOPTERA.

BY JOSEPH ALBERT LINTNER, ALBANY, N. Y.

[Read before the American association for the advancement of science at its Montreal meeting, August 1882.]

The sexual characters of insects have always been an interesting study to the entomological student, the more so as they are the less apparent, and discoverable, if to be found at all, only as the result of close observation and comparison. In the larger proportion of insects, in the perfect stage, they are so marked as to leave no doubt of the sex when the male and female are compared. Thus, in the hymenoptera, we have the ovipositor in its varied forms, often quite conspicuous. In the lepidoptera, among the *heterocera*, there are usually the more fully developed antennae of the male, and the broader, conical and more capacious abdomen of the female—features attaining their maximum development in the family of *bombycidae*. In the diptera, there are the larger and more approximate eyes in the male, and conspicuous structural differences in the antennae and suctorial apparatus in some of the families. In the coleoptera, there are often, in the male, stouter legs, broader tarsi, greatly elongated mandibles and other horn-like capital and thoracic processes. In the hemiptera, the vocal organs in the *cicadidae*, the ovipositor in several of the families, and the great sexual differences in size and in the presence or absence of wings are prominent features. In the orthoptera, there are the stridulating wing-nerves, the extended ovipositor, and a genital armature greatly varied in its adaptation to greatly differing habits. And in the neuroptera, distinctive male characters are found in clasping organs, in differences in color and in size, the long mandibles of *Corydalus*, the abnormal location of the intromittent organ in *libellulidae*, and in the elongated and forcipated genitalia of *Panorpa*.

In addition to such primary features as above noted, there are numerous secondary ones, which do not appear to be so dependent upon sex, and many of which seem almost to serve no higher purpose than that of ornamentation. Yet it is reasonable to believe that most of these differences have their use in the economy of nature, and that they aid in the continuance of the species.

Among such minor antigenetical features, may be mentioned, in the lepidoptera, the usually more angulated wings of the male; the simple frenulum of most of the male *heterocera* in con-

trast with the compound one in the female; the hairy anterior legs of *Grapta* and *Vanessa* in the *nymphalidae;* the long hairs between the costal and subcostal nervures, above the cell of the hind wings of *Argynnis*, appearing, when extended in the cabinet, like a long fringe to the inner margin of the front wings; the incrassated, black scale-patch upon the middle of vein 2 (the 1st median nervule) of the secondaries of *Danais;* the ovoid discal spot on the front wings of many of the *theclinae;* in the *hesperidae*, the reflexed costal margin in most of the *Nisoniades*, *Eudamus*, and *Pyrgus*, and the tibial epiphysis[1] of the anterior legs in all but one of our genera; the transverse discoidal stigma on the primaries of the larger portion of our pamphilas, the beautiful and peculiar microscopic (often concealed) scales, or androconia, of many of the butterflies; the usually concealed pair of extensile anal appendages found by Fritz Müller and others in certain *glaucopidae*, *bombycidae*, *noctuidae* and in a *Danais;*[2] each of these indicating the male sex. Features equally interesting, and alike serving no purpose so far as known, might be mentioned in each of the orders of insects.

In the earlier stages of insects (egg and larval), sexual features, as would naturally be expected, are less numerous and less conspicuous. They rarely occur in the first stage—that of the egg, or more properly, they have not, in many instances, been recognized by us.[3]

It was for a long time believed that in the larva of one of our *sphingidae* not unfrequently met with—*Thyreus abbotii*—the sex was so clearly indicated by difference in color and pattern that it could be told at a glance. Of the two greatly differing forms, the one marked with a series of large yellow-green patches on the dorsum extending halfway down the sides, and with another row of smaller subtriangular similarly colored spots resting on the prolegs, was described by Clemens as the male; the female being reddish-brown throughout, with a dark brown subdorsal stripe and numerous short broken striae.[4] This sexual determination of Clemens was accepted by me in my paper upon the larvae and pupae of this species in the 26th Report of the N. Y. state museum of natural history, p. 114-116, and has also been followed by other writers. That the two forms are indicative of sex, has since been denied,[5] and it is to be presumed that the denials are based upon results obtained in rearing them to their perfect form. The green-spotted larva may therefore be accepted as a dimorphic form, comparatively

[1] Guenée: Hist. nat. ins., 1852—Lepid., v.—Noct., 1, p. xxxv. Speyer: in Canad. entomol., 1878, v. 10, p. 124. Edwards' Catal. lep. Amer., 1877, p. 64.

[2] Fritz Müller: Nature, 11 June 1874, v. 10, p. 103 (Psyche, Mch.-Apr. [9 July] 1877, v. 2, p. 24). Morrison: Psyche [9] Oct. 1874, v. 1, p. 21-22. Siewers: Canadian entomologist, Mch. 1879, v. 11, p. 47-48, fig. 12. Stretch: Papilio, Feb. 1883, v. 3, p. 41-42, fig.

[3] In *Phylloxera*, the eggs which are to produce males and females may be known by their difference in size. See Riley's Annual reports of the state entomologist of Missouri: 6th, p. 41; 7th, p. 92, 98; 8th, p. 158.

[4] Two colored figures of the larvae in my possession, made by Dr. Clemens, show the sexes the reverse of this—the green-spotted one, marked as ♀, being much the larger of the two.

[5] Whitney: Canadian entomologist, April 1875, v. 8, p. 75-76. Grote: *id.*, May 1876, p. 100.

rare in my own collections and in the examples that have come under my observation.

The young collector of insects learns very early the simple method of determining the sexes of his Luna, Polyphemus, Promethea, and Cecropia pupae, and of many other bombycid pupae, by observation of the comparative breadth of their antennal cases.

A means by which the sex in the pupae of the *sphingidae* may be infallibly named, was pointed out by me in the Proceedings of the entomological society of Philadelphia, 1864, v. 3, p. 654. I have since found the same characters applicable to the *noctuidae* and to other *heterocera*.

Dr. C. V. Riley, in the Transactions of the academy of science of St. Louis, 1873, vol. 3, p. 128-129, and in the 6th annual report of the state entomologist of Missouri, for 1873, 1874, p. 131-132, has described and figured sexual differences in the pupae of *Pronuba yuccasella*, consisting, mainly, in the greater length of the "dorsal projections" on the several segments of the male, in the length of the last two segments as compared with those of the female (its shorter 11th and longer 12th), and in its less rounded apex. He says: "sexual distinctions are very rarely observable in chrysalids; but after I had learned to distinguish between them, I could readily separate the sexes in this case, and my judgment was confirmed upon the issuing of the moths."

A few years ago I discovered an interesting feature in the armature of the species of *Cossus*, by which the sex may at once be determined. I have, hitherto, withheld its publication, until I had studied others of our spined pupae and could illustrate this feature by proper figures; but the opportunity for this has not been found, and I accordingly defer no longer calling attention to it, that the observations of others in possession of more abundant material may supplement the few that have been made by me.

It is known to lepidopterists that most of the pupae of the species of moths which in their larval stage live in the interior of stems of plants and trunks of trees (endophytes), are armed upon their abdominal segments with transverse rows of teeth or spines, by the aid of which, when they are in readiness for their final transformation, they gradually work their way through the outer packing of their gallery and the bark, project their anterior segments to at least one-third the entire pupal length through the opening, and hold themselves securely during the eclosion of the moth.

This useful armature in the *cossinae*, and in such of the *aegeriidae* as I have had the opportunity of examining, consists of two rows of spines upon most of the abdominal segments, dividing them, when seen in extension, in three nearly equal parts. In *Cossus robiniae*, the species of the *cossinae* with which we are probably the most familiar, these rows occur on the fifth (the first stigmatal segment posterior to the wing-cases) and the following segments.

In *Cossus querciperda* alone of the

species known to me, they commence in a single row of minute dentations on the fourth segment. The principal features of this armature are the following:—It is always the stronger in the male sex—conspicuously so in *C. robiniae*, but less so in *C. centerensis*: the teeth increase in size from the fifth to the tenth segment: the anterior row is always the stronger in each sex; upon the fifth and sixth segments, it does not, in its lateral extension, reach below the stigma,[6] while upon the following segments it passes in front of the stigma and quite a distance beneath it: the posterior row is discontinued before reaching the line of the stigmata: the teeth show irregularity in form and size, particularly those of the posterior row.

The sexual distinction above referred to, presented in this armature, is this: in the male pupae two rows of teeth occur on segments five to ten inclusive; in the female, two rows on five to nine inclusive. In other words, *the male pupa shows* TWO *rows of teeth on segment ten, where the female shows but* ONE. In each sex, the eleventh and twelfth have but a single row. Disregarding, as I think we should in ordinary usage, the subdivision of what is usually known as the terminal segment, into demi-segments, or a segment and a subsegment, and that still farther refinement which would make of the extreme portion an additional segment with full numerical designation, then it will serve to prevent misapprehension of the particular section showing the sexual feature, if we indicate it as the *antepenultimate segment*. It would be the eleventh, if we commence enumeration, as some of our entomologists do, with the head, but the tenth, if, as seems to me more proper, we begin with the first thoracic ring.

Beside the *cossinae*, this same sexual feature occurs in the *aegeriidae*. I am not able to say if it extends throughout the entire family. At the time of this present writing, I have at my command only the pupae of *Aegeria exitiosa* and *A. tipuliformis*, and it exists in each. It probably occurs in the pupae of *Zeuzera* (one North American species described), in which the two rows of teeth are found on several of the segments, and perhaps also in *Hepialus*, the pupae of which (unknown to me) are characterized as very similar to those of *Cossus*.

Another interesting fact connected with the armature of *Cossus* is that the form, size, and position of the teeth vary to so great an extent in the different species, and show such distinctive characters, as to afford excellent specific features.[7] I would not hesitate to pronounce upon specific identity, upon an examination and comparison of the pupal armature alone.

[6] In *C. centerensis* it reaches below the stigma on the sixth.

[7] For comparison with other species of the *cossinae* it may be stated that an example of *C. centerensis* ♂ has thirty-eight teeth in the anterior row of the tenth segment, and twenty teeth in the posterior row—the latter, in their entire range, occupying a transverse space equal to that of nine teeth of the anterior row. The teeth are black, shining, irregular in size, and are slightly bent upward over their base; their length and the distance between their tips exceeds their basal width

TRIBUTE TO THE MEMORY OF JOHN LAWRENCE LECONTE.

BY CHARLES VALENTINE RILEY, WASHINGTON, D. C.

Dr. John Lawrence LeConte died at his residence in Philadelphia, 15 Nov. 1883. Nothing that we can say will render the memory of him more lasting or more dear, for he achieved pre-eminence in his chosen field of labor and won the love and respect of all who knew him.

LeConte was born in New York, 13 May 1825, and was graduated *M. D.* by the College of physicians and surgeons in 1846. He moved to Philadelphia some years later, and after his marriage abandoned the practice of medicine. He was lieutenant-colonel and medical inspector in the United States army during the civil war and, from 1878 till the time of his death, chief clerk in the United States mint at Philadelphia.

Luckily for American natural science his fortune was such that, with these two exceptions, he held no positions, but was able to devote his time to entomology. His chosen specialty was the coleoptera, and in order to fully appreciate the magnitude of the work which he accomplished and the difficulties with which he had to contend, it is necessary to consider the state of entomology in this country as compared with Europe at the time he began to write, now almost forty years ago. Great activity at that time prevailed in Europe in all branches of entomology. In descriptive coleopterology Aubé, Erichson, Germar, Klug, Lacordaire, Mannerheim, Mulsant, Schönherr, Serville, Solier, Stephens and others were active at that period. Others equally eminent had died shortly before and many came into prominence shortly afterward. Naturalists there were aided as well by the large number of skilled and enthusiastic amateurs who furnished an abundance of material and observations, as by the numerous large libraries, public museums and private collections to which they had access. Numerous entomological societies also brought the workers together, gave stimulus and encouragement and offered ready means of publishing.

How different the circumstances in America at that time! In the whole country there were no more persons scientifically interested in entomology than could be found in a single large city of Europe. The larger libraries were scant of entomological literature and there were neither standard nor public collections and but few private collections, of limited size. The most important of the older collections, viz., that made by Thomas Say, had been irretrievably lost through carelessness and indifference, while other valuable collections had shared no better fate. Contributions to the knowledge of our coleopterous fauna consisted chiefly of disconnected descriptions of single species scattered through all sorts of publications. "Can it be wondered at," LeConte wrote in one of his earliest papers, "that there is so much confusion

about the synonymy of our species, when they are published in every country of the globe, but in that in which they ought to be published?" The thankless task of identifying and correctly interpreting these descriptions, involving so much labor and patient study, was performed almost alone by LeConte, and so well that but few species of the older authors remain to-day unidentified. LeConte clearly saw from the beginning that American coleopterology could not be so much advanced by mere descriptions of new species and genera as by conscientious monographic work. The number of such monographic and synoptic papers published by him was great. Of special importance among his earliest papers are those on the *pselaphidae;* on the classification of the longicorn coleoptera, and of the *carabidae;* on the *elateridae* and on the *melolonthidae.* In 1861 his "Classification of the coleoptera of North America," prepared for the Smithsonian institution, began to appear. This work, though left incomplete until recently, was indispensible to every student of systematic coleopterology, and necessitated the publication of the "New species of North American coleoptera" and the "List of the coleoptera of North America," both issued by the Smithsonian institution.

His entomological writing was interrupted during the civil war, but was resumed again in 1865. From this time on he had the coöperation of Dr. George Henry Horn, who, from the beginning of his entomological career, was a faithful co-laborer with LeConte. Indeed the friendship and coöperation that always existed between these two specialists is one of the most pleasing and instructive incidents in the history of American entomology. LeConte must have felt proud of the excellent work done by the younger naturalist, and the manner in which Horn's more advanced views and often more thorough labors — made possible by accumulated knowledge and material — were accepted, even where they undid much of his previous descriptive work, was one of the truest marks of greatness in LeConte. The most important papers of this later period are those on the classification of the rhynchophorous coleoptera, and more especially "The *rhynchophora* of America north of Mexico," by John L. LeConte, assisted by George H. Horn, published in 1876 as vol. 15 of the Proceedings of the American philosophical society: a work which involved years of patient research and the value of which has not yet been fully recognized abroad. The last important work is the second and completed "Classification of the coleoptera of North America," by LeConte and Horn.

The list of Dr. LeConte's entomological writings has been carefully compiled (up to 1878) by Mr. George Dimmock, in his Special biblography, no. 1, and the actual amount of his descriptive work is well illustrated in Mr. Samuel Henshaw's "Index to the coleoptera described by J. L. LeConte, M. D." An additional paper by LeConte, to be published in the Transactions of the American entomological society, was about to be published at the time of his

death, so that he may virtually be said to have died in harness.

This brief reference to his published papers reflects but feebly the character and value of LeConte's life and work. Throughout his writings there is the evidence of a calm, dispassionate, well-balanced and philosophic mind, which, added to their accuracy, made him from an early day the leading authority on North American beetles the world over. Beginning when the idea of fixity of specific type was general, he easily followed the advance of evolutionary ideas, conforming his later work thereto, acquiescing and assisting in the "sinking" of his early species founded on too trifling variations.

His non-entomological writings evince culture, breadth of view and that rarest of qualities in specialists, common sense. He was not of the class who decry the practical application of knowledge as ignoble, but he felt rather that such application to man's wants is one of the aims of science. Thus he was always interested in the economic bearings of his favorite study and made several most valuable suggestions in his "Hints for the promotion of economic entomology in the United States" and his "Methods of subduing insects injurious to agriculture."

He was likewise for some years actively interested in endeavors to elevate the United States Department of agriculture, and was a candidate for the office of commissioner in 1877. As president of the American association for the advancement of science in 1874, and the first president of the Entomological club of that association, he took an active part in the attempt to bring about uniformity of terminology and the adoption of some general rules of nomenclature. He prepared, in conjunction with the writer, a memorial which in 1875 was signed by many members of the association praying Congress for the creation of a special entomological commission on a plan that would have been in many respects preferable to that upon which the United States entomological commission was finally created in 1877.

LeConte's taste for natural science was evidently inherited, and the family name is honored by several eminent scientists still living in this country and all of them, we believe, not very remotely connected. His father was a distinguished naturalist, and we were astonished at the beauty and accuracy of many of his yet unpublished drawings and paintings of animals which the son once showed us.

Few contemporary naturalists were better or more favorably known abroad than Dr. LeConte, and he was the first American elected to honorary membership of the Entomological society of France.

At a time when there was no national museum, before Dr. Horn had earned the fame he so richly deserves, and when the American entomological society showed no promise of being able to appreciate or properly care for his valuable collection Dr. LeConte bequeathed it to the Museum of comparative zoology, at Cambridge, where in Dr. Hagen's care it will form the most

precious systematic part of the Entomological department. When will our National museum fully warrant its name by becoming the one legitimate and most satisfactory repository of all such collections in whatever branch of science?

In closing this brief notice of one whose personal relations and whose appreciative and instructive correspondence with the writer during the past fifteen years will ever remain a green and pleasant memory, we would emphasize the fact that his writings throughout breathe a calm and judicial spirit, void of personality. The only instance that occurs to us where he gave expression to ruffled feeling is in the "Synopsis of the coleopterous insects of the group *cleridae* which inhabit the United States" (Annals lyceum nat. hist. N.Y., April 1849, v. 5, p 9–35). In the prelude to this paper he indulges in some severe reflections on the exclusive attitude of the Latin or South European countries toward the scientists of other countries, more particularly as exemplified by Spinola's work—reflections not altogether unwarranted even at the present time.

GILLS OF INSECT-LARVAE.

BY GEORGE MACLOSKIE, PRINCETON, N. J.

The gills of aquatic larvae of insects consist of elastic sacs arising as outgrowths of the epidermis and enclosing a system of fine branches from the air-tubes or tracheae, being thus pneumatic branchiae. They vary greatly in the number of the sacs, in the number and complexity of the enclosed air-tubes, and in their position. In the *elmidae* (of coleoptera) they are simple and are distributed ventrally on the abdomen; in *Ephemera* (of neuroptera) they are also simple, and extend from the sides of the abdomen; sometimes they are caudal appendages, and in the *libellulidae*, or dragon-flies, they become complex, having in some cases many sac-like lamellae, and many hundreds of branches in each, the whole structure planted within the rectum, from the walls of which the lamellar sacs open like so many pockets.

These structures have been described by Réaumur, Léon Dufour, Audouin, Oustalet,[1] and many others. Our present purpose is to rectify an error in their anatomy, as usually represented, which has important bearings on other questions.

It is usual to describe the laminae of the pneumatic gills as containing systems of fine tracheal loops, somewhat after the pattern of a plurality of carbon-wicks in an Edison lamp. Oustalet says, for example, in the *Annales des sciences naturelles* (1869, s. 5, v. 11), that the branchial laminae "include a veritable *chevelu* of tracheae folded on themselves so as never to reach the extremity of the fingers of the glove;" and that they serve as a loose sheath

[1] Ann. des sci. nat., Zool., 1852, s. 3, v. 17; 1862, s. 4, v. 17; 1869, s. 5, v. 11; 1872, s. 5, v. 16.

for a tracheal *arbuscle* (shrubbery) whose last ramifications are not only recurved but anastomosed so as to complete the circuit (*à plein canal*), thus forming veritable arches (*anses*). His figure agrees with his descriptive representation, showing the very numerous ultimate branches of the tracheae as completely arched, and his idea evidently was that there is a capillary circulation of air in the tracheal tubules like the capillary circulation of blood in the gills of fishes.

Chun[2] correctly shows that the rectal branchiae of *Libellula* are outgrowths of the [hind] intestine, having at their extremity no epithelial cells, but only the intima (or cuticle) enclosing the tracheal filaments. The epithelium gradually grows thinner from the base towards the extremity of the branchial laminae, and at length disappears, being afterwards represented only by the cuticle. The tracheae divide dichotomously, finally becoming capillary air-tubes, which this author also (being here inaccurate) supposes to reunite again into stronger stems. This part of his plate is so confused that one cannot make out whether the branches reunite again or not, and we presume that he did not try to follow them to their extremities.

In a specimen of these branchial laminae which we rolled under the cover-glass, we found that the multitude of tracheal ramifications ended caecally; all were of about the same length, their extremities recurved within the containing sac, and their tips not at all swollen, but rounded off. Thus if they were stretched out they would form a brush like the hairs of a horse's tail. As they are elastic and the enclosing sac is distensible, we think it highly probable that with each water-inspiration the sacs enlarge and the tracheal spray (having air forced in by the forward compression of the large tracheae) spreads out so as to bring the full tide of air close to the tide of water. Léon Dufour seems to have had some process like this in view when he said that each lamella of the branchia of *Potamophilus* is "probably swollen during life by air transmitted by endosmosis." As we understand the case, the air is injected into the branchiae from the rest of the body by rhythmical contractions, and its gases then communicate endosmotically with those in the tidal water, so as to secure renovation.

The paper by N. and E. Joly on the larva of *Prosopistoma*[3] confirms our observation. This larva was supposed by Latreille, Duméril and Milne-Edwards to be a branchiopod crustacean, and is so described in Milne-Edwards' *Histoire des crustacés* (v. 3, p. 558). But MM. Joly found out that it was the larva of a coleopterous insect,[4] and they figure and describe its external

[2] Chun, Carl. Ueber den bau, die entwickelung und physiologische bedeutung der rectaldrüsen bei den insekten. Inaugural-dissertation. . . . Frankfurt a. M., 1875.

[3] Joly, N. *and* E. Etudes sur le prétendu crustacé au sujet duquel Latreille a créé le genre *prosopistoma*, et qui n'est autre chose qu'un véritable insecte hexapode. (Ann. des sci. nat., Zool., 1872, s. 5, t. 16, no. 7, p. 1-16, pl. 13.)

[4] It is in fact one of the *ephemeridae*..

tracheal branchiae, showing that the branches of the tracheae end caecally. In this case the branches are so few that their terminations can be easily made out.

The importance of this anatomical item depends on its bearing on the functions of the whole tracheal system. The action of the tracheae is tidal rather than by peripheral capillary circulation. Here also the endings of the ramifications are found to harmonize with their internal terminations along the nervous and digestive tracts, and in other parts of the tissues which they supply. We never find a double system of tracheae with capillary ramifications interposed for the transmission of air from one system to the other. It is not easy, in the living insect, to determine the ebb and flow directly; as the movements occur suddenly, have their speed multiplied by the degree of microscopic amplification; and hence we are able only to see the rhythmical peristaltic action, and are left to guess at its cause. We find, however, the muscular contractions and expansions of other parts of the body synchronizing with the pulsations in the gills, and thus explaining how the flux and reflux, rather than a mere circulation of the air, is the cause of its renewal.

Princeton, N. J., 12 Dec. 1883.

THE SCREW-WORM FLY, *COMPSOMYIA MACELLARIA*.

BY SAMUEL WENDELL WILLISTON, NEW HAVEN, CONN.

In connection with Professor Snow's article on this fly [1] it seems worth while to give a brief synopsis of papers published in the past few years by the able dipterologist of South America, Dr. E. L. Arribálzaga, of Buenos Aires. From his studies he has ascertained no less than twenty-six different specific names that this fly had received! It is possible that some of these names would apply to distinct species were their types examined, but it is a thankless task to endeavor to make order out of the chaos in which Walker, Macquart, and Robineau-Desvoidy have involved the subject, and the result of Arribálzaga's thorough studies can with propriety be adopted. To these results, however, Mr. J. Bigot, of Paris, has recently taken exception, in a note [2] on Professor Snow's paper. This author's penchant for making synonyms himself may perhaps have something to do with his wishing to preserve species founded on inadequate grounds. His argument that "il me semble fort hasardeux d'avancer *qu'un seule et même espèce* se retrouve, en permanence, depuis les confins de la Patagonie jusqu'au delà des provinces centrales de l'Amérique du Nord, vivant indifféremment sous les zones torrides, tempérées et même froides?" is of little value, when the

[1] Psyche, Mar.-Apr. 1883, v. 4, p. 27-30.

[2] Bull. soc. entom. France, 12 Sept. 1883, no. 17, p. 154-155.

author himself should know that other American flies *do* have a similar range of habitat, to say nothing of the nearly allied *Musca domestica*.

The specimens which Professor Snow sent me for examination, although somewhat injured, certainly seem to me to be *Compsomyia macellaria* (Fab.) E. Lch. A. The species may, with tolerable certainty, be recognized by its having a bright metallic green or coppery color on the abdomen and thorax, the latter above with three black stripes; the bristle of the antennae feathered to the tip, and the head, except the eyes, chiefly yellow. In size it varies from seven to ten millimetres.

However, these systematic details will be of less interest than the following, which I translate from the Spanish of Arribálzaga[3]:

"During the pleasant days of spring or the hotter ones of summer, these flies may be seen covering in great numbers, now umbelliferous flowers, now all sorts of filth; or, resting, there glistens in the sunlight the iridescent surface of their half-opened wings, and the blue, the green, the violet, the copper and the gold of their metallic colored bodies."

"Our fly deposits its eggs, commonly called '*queresa*,' in dead bodies, in manure, in fresh meat reserved for food, and soon there appear immense numbers of voracious larvae that rapidly consume the objects in which has begun their active life. Not content with these habits, common to all the species of the group to which it pertains, it deposits the germs of its posterity in the wounds of men and of animals, at the entrance of openings of the human face, and, in its anxiety for propagation, will deposit them in the wool of sheep."

"Azara was, I believe, the first observer who noted cases of human myiasis in South America. Coquerel, many years later, called the attention of physicians and naturalists to the frequent and fatal accidents which this evil produces among the exiles of Cayenne: according to this author, Dr. Chapuis, physician-in-chief of the French marine, attended one case in which the larvae of *C. macellaria* had penetrated to the frontal sinuses, causing the death of the patient; also one very unclean person attacked in the nasal fossae and the pharynx, who succumbed after he had ejected one hundred and twenty larvae. There were, as M. St. Pair observed, in the same country, six similar cases, of which three terminated in the death of the patients after cruel sufferings; in two the nose was destroyed, and in the last there was a deformation of the olfactory organ. In another case observed by M. St. Pair there were removed, by means of injections, more than three hundred larvae, but he was not able to obtain them all, and the remainder soon penetrated the ball of the eye, destroying the lower eyelid in consequence of gangrene, invaded the mouth, corroded the gums and laid bare the inferior maxillary; the victim died seventeen days after his entrance into the hospital."

[3] Anales de la soc. científica argentina, v. 10, p. 80-84.

After giving records of numerous other cases he further adds:

"To Dr. Lesbini, of Córdoba, are due the better observations upon cases of myiasis produced by *C. macellaria*. The first case presented itself in an old foreigner who had an ulcer in his leg filled with these larvae; the second case occurred in Córdoba, in a boy of seven years, attacked in the left ear; the third and last case was in a girl of sixteen years, also of Córdoba, affected in the nasal fossae by the presence of two hundred and fifty larvae: all these patients were saved."

"It is probable that, attracted by the fetid odor of unclean individuals, these flies hover over the mouth or the nose, and thus deposit their eggs; some affirm that they at times enter the passages for this purpose."

"The area of distribution of *Compsomyia macellaria* is very great, and will be, I believe, yet greater with time, since their habits facilitate their transportation by man from one region to another; hitherto they have been observed in the following countries: Islands of America (*Musca macellaria* F.), N. America (*Chrysomyia tibialis*, *C. l'herminieri*, *C. caerulescens*, *C. decora* *C. plaei* R.-Desv.), Mexico (*Lucilia hominivorax*), Cuba, Colombia, Venezuela, Cayenne, Brazil, Peru, Chili, Uruguay, Argentine Republic and New Holland."

INFLUENCE OF COLOR ON INSECTS.—The following extract from the recently published second part of vol. 1 of "Timehri," the Journal of the Royal agricultural and commercial society of British Guiana, so ably edited by Mr. E. F. im Thurn, may be of interest to our readers. It occurs in an account of a visit to Mount Russell in Guiana, by the editor (p. 223):—

"That afternoon the Indians of the place, seeing our interest in catching butterflies, exhibited various clever ways of entrapping these insects. To catch those of yellow hue, they picked and laid on the ground the flowers of a yellow *Bignonia* (*B. chicka*); and this proved a most successful plan. Equally successful were they when they laid decaying banana-skins on the ground to attract the large blue *Morphos;* but an attempt to attract certain red species by displaying the ripe red fruit of the faroah plant (*Bixa orellana*) was not successful. Then, these methods of enticing the insects were completed by inverting a round quake (a wide-mouthed basket of very open wicker-work) over the bait, taking care to raise the quake so that its lower edge was some inches from the ground. The butterflies, attracted by the flowers, made their way under the raised edge of the quake, and when the Indians approached flew, not out under the edge of the quake, but upward into the top, where they were captured."—E. C. R., in *Entomologist's mo. mag.*, June 1883, v. 20, p. 15–16.

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TOWNEND GLOVER.

Born Aug. 1812, in Rio de Janeiro, Brazil.
Died 7 Sept. 1883, in Baltimore, Maryland.

Among the recent deaths of naturalists we have now to chronicle that of Professor Townend Glover, which occurred in Baltimore, Maryland, 7 September 1883, at the residence of his adopted daughter, Mrs. Daniel Hopper.

Prof. Glover was born of English parents, at Rio de Janeiro, on the 11th (or 12th) of August 1812, and consequently at the time of his death was in his seventy-second year. He received his early education in England, completing his studies in Germany, after which his roving disposition brought him to North America, where, for a time, his horse, his rod or gun were almost constant companions. After marriage he settled at Fishkill-on-the-Hudson, devoting himself to amateur gardening and horticulture, and it was here that his tastes for entomology were developed. About 1853 he became connected with the Bureau of agriculture, then a division of the United States Patent office, spending several years in the south, — at one time visiting Demerara for the purchase of sugar-cane for government experiment, — studying the habits of the cotton and orange insects, of which little had then been written, besides employing his time in other ways. The results of these investigations, as published in the reports of the Patent office from 1854 to 1858, are already well known to entomologists. Just prior to the war, Mr. Glover accepted a professorship in the Maryland agricultural college, where his great work on entomology was begun, he having previously learned engraving of Mr. Gavitt, of Albany, with this object in view. Upon the formation of the present United States Department of agriculture, he was appointed its first entomologist, which position he held until the spring of 1878, when ill-health compelled him to rest from his labors.

An observer contemporaneous with Harris, his first writings appeared in the *Cultivator* and similar journals of the time, though the great mass of his notes of investigation and observation were never given to the world, but remained locked in his work on American entomology, which he had hoped to complete and publish in his life-time. His "work" was his dream, and here for years he accumulated a mass of interesting facts, the publication of which, as discovered, would have made his name as an observer great indeed. Some of these facts have been given to the world in his published reports as United States entomologist, but the majority were withheld from publication, — awaiting the completion of his work — until, from time to time, many of his interesting discoveries were re-discovered and published by the army of careful observers who have come after him, and the credit has thereby been lost to him. Perhaps it was his over conscientiousness which kept him from "rushing into print," for he often underrated his own judgment in citing the histories of insects he had carefully reared and observed, rather preferring to give the experience of another with full credit, than to use his own material.

Susceptible to the world's praise, he shrank from its censure, which alone may be given as a reason for his never having named a species, or, to use his own words, helped to mix up the nomenclature.

Of his labors only those who were intimately associated with him will ever know how untiring and persistent—even methodically so—were his efforts. For years, all the available moments of daylight, "out of office hours," were given to engraving the copper plates; the evenings were devoted to writing, while into that uncertain limit 'twixt bedtime and the time for blowing out the candle, were crowded all his mental recreation, reviewing of new books, reading the magazines and the *Herald*, or, sometimes, even a popular novel.

Whether his work will ever be given to the world or not, in its entirety—despite the efforts of some to belittle it—it is simply a colossal encyclopaedia of American entomology, comprising names, derivations from the Latin or Greek, and synonyms of thousands of species of insects, with histories, food-plants, remedies, habitat, etc[1]., a library in itself, complete in detail, and comprehensive in inception to a wonderful degree. It is now in the possession of the United States government, and its great size will doubtless be the chief obstacle in the way of its publication.

CHARLES RICHARDS DODGE.

The complete set of illustrations comprises 273 quarto plates with 6179 figures, engraved on copper, and covering the following subjects:—

	Plates.	Figures.
Lepidoptera	138	2634
Coleoptera	49	1627
Diptera	13	520
Hemiptera	16	464
Hymenoptera	10	346
Orthoptera	18	281
Neuroptera	7	92
Cotton and its insects	22	215

Only 15 complete copies (author's proofs) of the work are in existence, six of which are in Europe and nine in this country. In general not more than 50 copies of any work were printed, the text being lithographed from the author's manuscript.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

13 APRIL 1883.—The 92nd meeting of the Club was held at 19 Brattle Square, Cambridge, 13 April 1883. In the absence of the President, Mr. Hayward was chosen Chairman. Five members were present.

Mr. S. H. Scudder showed a collection of colored figures of North American coleoptera, hymenoptera and diptera, drawn by Maj. LeConte, and now belonging to Dr. J. L. LeConte.

Mr. G. Dimmock read a paper on "The cocoons of *Cionus scrophulariae*." The cocoons of this European species of *curculionidae* imitate the fruit of *Scrophularia nodosa*. A sprig of *Scrophularia*, with cocoons of *Cionus* upon it, was shown. [The paper will appear in *Psyche*, v. 3.]

Mr. S. H. Scudder called attention to B. N. Peach's paper, entitled, "On some fossil myriapods from the lower old red sandstone of Forfarshire" (Proc. Roy. phys. soc. [Edinb.], 1881-1882, p. 177-188, pl. 2) in which two fossil myriapods from the devonian of Scotland are described. These two myriapods (*Kampecaris forfarensis* and *Archidesmus macnicoli*) are probably the oldest insects known.

WE HAVE received the first seven numeros of the *Practical naturalist*, a monthly which Ward and Riley have started at Bradford, England. It consists of twelve octavo pages monthly, neatly printed and in a tasty cover, at the remarkably low price of 1s. 6d.[37½c.] (postpaid) to the United States, or Canada. The publication is "devoted to the assistance and encouragement of lovers of nature," and contains interesting original notes on entomological subjects. The editors ought, however, to exercise more care in proof-reading. The International news company, of New York, are American agents for the sale of this paper.

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard: S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Packard, Alpheus Spring, *jr.* Descriptions of some new ichneumon parasites of North American butterflies. (Proc. Boston soc. nat. hist. [16] Aug. 1881, v. 21, p. 18-38.)

Crit. rev., by C: V. Riley, entitled "Notes on microgasters." (Amer. nat., Aug. 1882, v. 16, p. 679-680.

Describes *ophion tityri* (from *eudamus tityrus*), *campoplex pieridicola* (from *pieris rapae*), *ichneumon hunteræ* (from *pyrameis huntera*), *i.* sp., *i. tharotis* (from *melitaea tharos*), *microgaster carinata* (from *pyrameis atalanta*), *m. pieridis* (from *pieris rapae*), *m. atalantae* (from *pyrameis atalanta*), *m. carduicola* (from *p. cardui*), *m. lunatus* (from *papilio asterias*), *encyrtus turni* (from *p. turnus*), *eulophus thecla* (from pupa of *thecla calanus*), *e. saundersii* (from pupa of same?), *entedon antiopae* (from *vanessa antiopa*). *trichogramma minutissimum* (from *papilio turnus*) *pompilus* sp. ("from *grapta interrogationis*"), 16 new species; and re-describes *trogus* ["*trogon*"] *exesorius* (from pupae of *papilio*), *apanteles limenitidis* (from *limenitis disippus*), *pteromalus puparum* (from *pieris rapae*), *encyrtus montinus* (from pupa of *chionobas semidea*), *eulophus semideae* (from *ch. semidea*), *trichogramma minutum* (from *limenitis disippus*), and each genus, except the last, of these parasites; compares the described species and genera with others.

B: P. M. (3338)

Riley, C: Valentine. The false indigo gall-moth: *walshia amorphella*, Clemens. (2d ann. rept. state entom. Mo., [Mch.] 1870, p. 132-133, fig. 98.)

Description and figures of gall, larva and imago of *walshia amorphella*, found on *amorpha fruticosa*; hibernation of the larva. *B: P. M.* (3339)

[Riley, C: Valentine.] Gall on *pelargonium*. (Amer. entom., Mch. 1880, v. 3, n. s., v. 1, p. 78, 6 cm.)

Letter from M. T[reat], with answer; a gall, "growing at the base of a healthy *pelargonium*," contained *podura*; the gall apparently made by a mite, and the *podura* undoubtedly feeding on the diseased gall-tissue.

B: P. M. (3340)

Riley, C: Valentine. Gall-nuts. (Johnson's new univ. cyclop., 1876, v. 2, p. 417,1 fig.)

Definition of "gall-nuts," formed by *cynips gallae-tinctoriae* on twigs of *quercus infectoria*; local origin, chemical composition, use in the arts.

B: P. M. (3341)

Riley, C: Valentine. Galls. (Johnson's new universal cyclop., 1876, v. 2, p. 417-419, 2 fig.)

Definitions of "galls;" their variety of form, texture and location, their nature and source.

B: P. M. (3342)

Riley, C: Valentine. The misnamed gall-moth: *eurytychia, saligneana*, Clemens. (2d ann. rept. state entom. Mo., [Mch.] 1870, p. 134-135, fig. 99.)

Description and figure of gall and imago and brief description of larva of *eurytychia saligneana*; characters of the genus; this moth may be an inquiline. General remarks on the formation of galls by lepidoptera.

B: P. M. (3343)

Riley, C: Valentine. Notes on microgasters. (Amer nat., Aug. 1882, v. 16, p. 679-680.)

Crit. rev. of A. S. Packard, jr.'s "Descriptions of some new ichneumon parasites of North American butterflies" (Proc. Boston soc. nat. hist., [16] Aug. 1881, v. 21, p. 18-38) [Rec., 3338]; synonymical notes on *microgaster carinata* [=*m. gelechiae* var.], *m. pieridis* || [=*apanteles congregatus* var. *pieridivora* n. var.] *m. atalantae* [=*a. congregatus* var.], *m.* [*apanteles*] *carduicola* and *m.* [*a.*] *lunatus*.

B: P. M. (3344)

Riley, C: Valentine. Notes on North American microgasters, with descriptions of new species. (Trans. acad. sci. St. Louis, [May] 1882, v. 4, p. 296-315, 9 fig.)

Separate. [St. Louis, Mo.], Apr. 1881. ½-t.-p. cover+20 p., 23×16. il.

Sketch of previous knowledge of the North American *braconidae* closely related to *microgaster*; characteristics and habits of the group; definition of the genera *microplitis*, *microgaster* and *apanteles*; description of typical larva (of *apanteles aletiae*) and of cocoons and the manner of their construction; effect of the presence of parasites upon the longevity of the host; occurrence of secondary parasites in these parasites; description, with notes on the habits, of the following new species: *microplitis ceratomiae, m. gortynae, apanteles megathymi, a. cacoeciae, a. aletiae, a. politus, a. cassianus, a. theclae, a. smerinthi, a. acronyctae, a. paleacritae*, and of the following new varieties: *apanteles limenitidis* form *flaviconchae, a. congregatus* var. *hemileucae* and var. *rufocoxalis* and var. *scitulus*; synonymical list of North American species of these three genera heretofore described. *B: P. M.* (3345)

Riley, C: Valentine. The smaller corn stalk-borer. *Pempelia lignosella* Zeller. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883), p. 142-145, pl. 7, fig. 3.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 142-145 [82-85], pl. 7, fig. 3.)

Ravages, habits, seasons, natural history, geographical distribution and synonymy of, and means against *pempelia lignosella;* description and figures of larva, pupa and imago, of structural details of mouth-parts and antennae of male imago, of markings of larva, and of injury done to corn-stalks. *B: P. M.* (3346)

Riley, C: Valentine. The sorghum web-worm. *Nola sorghiella*, new species. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 187-189, pl. 11, fig. 1.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 187-189 [127-129], pl. 11, fig. 1.)

Habits, ravages and classificatory relations of *nola sorghiella* n. sp.; figures and description of larva, pupa and imago; figures of head of *sorghum* injured by the larva. *B: P. M.* (3347)

Riley, C: Valentine. The water weevil. *Lissorhoptrus simplex* Say. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 130-133, pl. 6, fig. 4.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 130-133 [70-73], pl. 6, fig. 4.)

Seasons, habits, ravages, classification and synonymy of *lissorhoptrus simplex;* description and figures of larva and imago; includes extract from J. Screven's letter in author's "The 'water-weevil' of the rice plant" (Amer. nat., June 1881, v. 15) [Rec., 3335], p. 483, and extract from a report by L. O. Howard; *spalacopsis suffusa* and *hippopsis lemniscata* boring in stems of *chenopodium anthelminticum.* *B: P. M.* (3348)

[**Walsh**, B: Dann *and* C: Valentine **Riley**.] Galls and their architects. (Amer. entom., Feb. 1869, v. 1, p. 101-110, 389 cm., fig. 78-90; p. 144, 3 cm.)

Definition and classification of galls; variety of their sizes, shapes, colors, tastes, consistency, situation, construction and parentage; accounts of some galls made by *cynipidae, cecidomyidae,* and *aphidiidae,* and of the gall-makers; figures, describes and treats especially of galls of *cynips quercus-spongifica, c. q.-inanis, c. q.-prunus* n.sp., *cecidomyia salicis-strobiloides, c. s.-brassicoides, c. vitis-pomum* n.sp., *c. v.-coryloides* n.sp., *pemphigus vagabundus, p. rhois* and *glyphina ulmicola;* describes imago of *cynips q.-prunus* n. sp., and of *pemphigus ulmi-fusus* n. sp., and larvae of above new species of *cecidomyia;* dimorphism of gall-makers; occurrence of inquilines and parasites in galls. [Continued in authors' "Galls and their architects: 2d article" (*op. cit.*, Nov. 1869, v. 2, p. 45-50) (Rec. 3350).]
B: P. M. (3349)

[**Walsh**, B: Dann *and* C: Valentine **Riley**.] Galls and their architects: 2d article. (Amer. entom., Nov. 1869, v. 2, p. 45-50, 242 cm., fig. 30-32.)

[Cont. from authors' "Galls and their architects" (*op. cit.*, Feb. 1869, v. 1, p. 101-110) (Rec., 3349).] Definition and classification of galls; descriptions and figures of galls and larvae and descriptions of imagos of *nematus salicis-pomum, euura s.-ovum,* and *e. s.-gemma;* habits and seasons of these insects and of *anthonomus sycophanta, batrachedra salicipomonella* and *nematus mendicus,* inquilinous in the galls of *nematus s.-pomum* and in other galls; evidences distinguishing gall-makers from inquilines; balance of nature; dignity of entomology; reasons for preferring the name *euura s.-gemma* to the prior name *e. orbitalis.* [Cont. in authors' article of same title (*op. cit.*, Dec. 1869-Jan. 1870, p. 70-74) (Rec., 3351).] *B: P. M.* (3350)

[**Walsh**, B: Dann *and* C: Valentine **Riley**.] Galls and their architects: 2d article. (Amer. entom. Dec. 1869-Jan. 1870, v. 2, p. 70-74, 193 cm. fig. 45-47.)

[Cont. from authors' article of same title (*op. cit.*, Nov. 1869, p. 45-50) (Rec. 3350).] General remarks explanatory of the occurrence of distinct genera of gall-insects on plants of distinct genera; figures and descriptions of galls of *cynips quercus-seminator* and *c. q.-frondosa:* nature of these galls and of those of *c. q.-operator;* seasons of the gall-makers; *nematus quercicola* inquilinous in galls of *c. q.-frondosa;* synoptical table of North American genera of *cynipidae psenides;* description of *antistrophus* n. g. (*cynipidae*), and of gall and imago of *a. lygodesmiaepisum* n.sp. [Cont. in authors' article of same title (*op. cit.*, Feb. 1870, p. 103-106) (Rec., 3352).]
B: P. M. (3351)

[**Walsh**, B: Dann *and* C: Valentine Riley.] Galls and their architects: 2d article. (Amer. entom., Feb. 1870, v. 2, p. 103-106, 144 cm., fig. 68-71.)

[Concluded from authors' article of same title (*op. cit.*, Dec. 1869-Jan. 1870, p. 70-74 (Rec., 3351).] Figure and description of the gall *rubi podagra* n.sp., made by *agrilus ruficollis,* of the gall *vitis vulnus* n.sp., made by *baridius sesostris,* of the larva and imago of the former insect and of the imago of the latter; habits and food-plants of and means against these insects; history of the names of the latter and of its gall; brief description of gall and of imago of *madarus ampelopsidos* n.sp.; habits of *buprestidae.*
B: P. M. (3352)

[**Walsh**, B: Dann *and* C: Valentine **Riley**.] The trumpet grape-gall. (Amer. entom., Sep.-Oct. 1869, v. 2, p. 28, 18 cm., fig. 27.)

Description and figure of galls of *cecidomyia vitis-lituus* n.sp. [=*c. vitis-viticola*], the gall-maker being unknown; enunciation of general law that when one gall-insect inhabits a plant, many more species of the same genus of insects generally inhabit the same genus of plants; occurrence of the same or similar galls on several varieties of grape-vines and of related galls on leaves of *carya* and *celtis.* *B: P. M.* (3353)

ENTOMOLOGICAL ITEMS.

MR. C. J. A. PORTER published, in the *American naturalist* for December 1883, a most thoroughly unscientific report on some experiments to test the function of the antennae of insects.

THE *Bulletin d'insectologie agricole* for July-September contains an interesting account of the exhibition of insects held last July in the palace of industry, at Paris, together with a list of the prizes and medals awarded to exhibitors.

THE NOVEMBER numero of that enterprising magazine, *the Kansas City review*, contains, besides other interesting articles, not pertaining to entomology, an agreeable paper by T. Berry Smith on "Natural science in the 17th century," and an abstract, by Dr. C: V. Riley, on "Emulsions of petroleum and their value as insecticides."

CIRCULAR NO. 1 of the Department of entomology of the New York state museum of natural history, issued by Mr. J. A. Lintner in October, contains notes upon the chinch-bug. *Blissus leucopterus*, and its attack upon the crops of portions of St. Lawrence county, New York. An enlarged figure of the insect and directions for checking its depredations are given. Whether these insects have done any serious damage to crops in Massachusetts this year, or not, I do not know, but on 28 March the low land between Belmont and Cambridge was swarming with them. *G: D.*

AGAIN WE have the unpleasant duty of recording the death of one of our leading American entomologists. Dr. John L. LeConte, whose numerous publications on North American coleoptera have rendered the systematic study of these insects so easy, died at his home in Philadelphia, 15 Nov. 1883. The December numero of the *Bulletin of the Brooklyn entomological society* contains a portrait of Dr. LeConte, and an obituary notice by Mr. F. G. Schaupp. The notice which appears in this numero of PSYCHE was originally written, at the request of Dr. A. S. Packard, *jr.*, for the entomological department of the *American naturalist*, which department Dr. Riley has been editing. The exclusion of the article by Prof. E: D. Cope, one of the editors of the *American naturalist*, against the protest of Dr. Riley, has caused the latter's withdrawal from that magazine. The notice having been offered to PSYCHE with this explanation, we are pleased to publish it as a token of the high esteem in which we held the late coleopterist, and of our appreciation of the competency of the distinguished author to write such a notice as shall command respect from any journal in the land. We had intended to write a notice, which we will now omit.

AT A recent meeting of the French entomological society, Dr. Laboulbène instanced a case in which dipterous larvae had been vomited by a woman thirty-nine years old, under the care of Dr. E. Pichat of La Rochelle. Specimens of the pupa, and of the fly hatched from them (*Curtoneura stabulans* Fall.), were exhibited to the society. The woman had been troubled for some days with bronchitis and very fetid breath, and finally, after a severe attack of coughing, vomited twice. Dr. Pichat afterward found in the basin used a hundred to a hundred and fifty of these larvae; and the circumstances as related by him leave no serious doubt of their source, though he was not present during the vomiting, but only called immediately after it.

This larva, according to Laboulbène, is well known, and is ordinarily found in decomposing animal and vegetable matter, in mushrooms, etc., and has also been reared from caterpillars and hymenopterous larvae.

The possibility of the existence of such flies (*muscariae*) in the human body was formerly generally accepted, but has lately been denied by Davaine. Experiments have proved, says Dr. Laboulbène, that such larvae, introduced into the stomach of animals by a fistula, have been discharged alive in the excrement, one, two, or even three days later. — *Science*, 23 Nov. 1883, v. 2, p. 697.

THE FOLLOWING notes upon the medicinal use of preparations of *Blatta orientalis* are

extracted from an abstract given in the *Deutsch-amerikanische apotheker-zeitung*, 1 Apr. 1883, jahrg. 4, p. 49, of a paper by T. Bogomolow, published in the *St. Petersburg med. wochenschrift:*

Bogomolow first introduced this medicine into practice in 1876. In the course of the last six years it has been used successfully for dropsy by several physicians, while others have had negative results. Favorable action resulted in 47 per cent. of cases published heretofore. Bogomolow mentions 70 additional cases, in 29 of which the medicine was administered in powdered form, and in 41 as tincture. In 19 cases the author brought about profuse perspiration, in 61 cases clear increase of urination, and in 13 cases increase of intestinal evacuation (by stronger transudation through the intestinal walls). He had in no case seen symptoms of irritation or other inconvenient accessory action. The tincture was prepared by soaking well-dried and pulverized cockroaches in six times their weight of 95 per cent. alchohol for two or three days in a warm place. Of this tincture the author prescribes for adults a tablespoonful thrice daily, for children twenty drops thrice daily. The powder is to be used only in case of emergency, and spoils easily by exposure.

SOCIETY MEETINGS.

THE REGULAR meetings of the Cambridge Entomological Club will be held at 7.45 p. m., on the days following:—

12 Oct. 1883.	14 Mar. 1884.
9 Nov. "	11 Apr. "
14 Dec. "	9 May "
11 Jan. 1884.	13 June "
8 Feb. "	

G. DIMMOCK, *Secretary.*

THE NEW YORK Entomological Club meets twice monthly, except in June, July and August, but no special date is fixed for each meeting.

HENRY EDWARDS, *Secretary.*

THE REGULAR meetings of the Entomological Section of the Boston Society of Natural History will be held at N. W. corner of Berkeley and Boylston Sts., Boston, Mass. at 7.45 p. m., on the days following:—

24 Oct. 1883.	27 Feb. 1884.
28 Nov. "	26 Mar. "
26 Dec. "	23 Apr. "
23 Jan. 1884.	28 May "

EDWARD BURGESS, *Secretary.*

THE REGULAR meetings of the Entomological Section of the Academy of Natural Sciences, of Philadelphia, Pa., will be held at S. W. corner of 19th and Race Sts., on the days following:—

12 Oct. 1883.	14 Mar. 1884.
9 Nov. "	11 Apr. "
14 Dec. "	9 May "
11 Jan. 1884.	13 June "
8 Feb. "	

JAMES H. RIDINGS, *Recorder.*

THE SEMI-ANNUAL meetings of the American Entomological Society will be held at S. W. corner of 19th and Race Sts., Philadelphia, Pa., on the days following:—

10 Dec. 1883.	9 June 1884.

JAMES H. RIDINGS, *Recording Secretary.*

THE REGULAR monthly meetings of the Montreal Branch of the Entomological Society of Ontario, will be held at Montreal, Que., Canada, on the days following:—

2 Oct. 1883.	5 Feb. 1884.
6 Nov. "	4 Mar. "
4 Dec. "	1 Apr. "
8 Jan. 1884.	6 May "

G. J. BOWLES, *Secretary.*

THE MONTHLY meetings of the Brooklyn Entomological Society will be held in the rooms of Wright's Business College, Broadway, corner of Fourth Street, Brooklyn, E. D., the last Saturday of each month except July and August.

F. G. SCHAUPP, *Secretary.*

No. 113-114 were issued 16 Nov. 1883.

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Vol. 4. No. 117-118.

JANUARY-FEBRUARY 1884.

CONTENTS:

ADVERTISEMENTS 122
ON THE LIFE-HISTORIES AND IMMATURE STAGES OF THREE EUMOLPINI — *Stephen Alfred Forbes* 123-130
COLLECTION AND PRESERVATION OF DIPTERA — *Samuel Wendell Williston* . 130-132
MUSEUM PESTS OF SERVICE TO THE ENTOMOLOGIST — *L. O. Howard* . . . 132
PROCEEDINGS OF SOCIETIES — Cambridge Entomological Club — Biological Society of Washington 133-134
BIBLIOGRAPHICAL RECORD, no. 3354-3405 135-138
ENTOMOLOGICAL ITEMS — Society Meetings 139-140

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PSYCHE.

ON THE LIFE-HISTORIES AND IMMATURE STAGES OF THREE *EUMOLPINI*.

BY STEPHEN ALFRED FORBES, NORMAL, ILLINOIS.

[*With Plate 1.*]

The three species to which this paper is devoted (*Colaspis brunnea* Fab., *Paria aterrima* Oliv., and *Scelodonta pubescens* Mels.), live underground in the larval stage, and feed upon the roots of the strawberry (*Fragaria vesca* L.). The larvae of all three often occur in the same localities and situations; they are extremely similar in general appearance, two of them (*Paria* and *Scelodonta*) being, indeed, almost indistinguishable; and their food-plants and food-habits are identical. They have consequently not been discriminated heretofore, even where they have been collected in considerable numbers and studied with some care; and their life-histories, as far as made out, have very naturally fallen into some confusion.

The following account is based upon almost continuous observation of one of the species, upon breeding experiments with all three, and upon numerous collections of all, made from August 1882 to December 1883, mostly in southern Illinois, where all are abundant in strawberry fields.

COLASPIS BRUNNEA Fab.

Literature.

The first undoubted reference to an immature stage of this beetle, which I have found, is in the 3rd report of the state entomologist of Missouri (C. V. Riley), for 1871, p. 81-84, in which the larva is described and figured, and record is made of the fact that it feeds upon the roots of the strawberry. A brief outline of its life-history is also given, but in terms to show that it was not at that time distinguished from the larva of *Scelodonta*.

In his report as state entomologist for the following year, p. 34, Mr. Riley again described this larva from numerous specimens, and figured the dorsal and ventral aspects of the head, a separate mandible, and one of the ventral segments. The description given of the mandible and of the anal segments, and the figure of the former, do not apply exactly to the larva of *Colaspis*, and it is possible that the specimens upon which this second description was based belonged to one of the other species.

In the American entomologist for 1880, v. 3, p. 243, Mr. Riley repeats his original figures of the *Colaspis* larva; and this form has since been mentioned frequently in various economic publications, but without any further additions to our knowledge, either of its characters or of its history. The pupa has remained hitherto unknown.

Description.

Larva. (Pl. 1, figs. 7-8.) This species is 3 to 4 mm. long by one-half that width, white throughout, except the

head and the first segment, which are a pale, yellowish brown. The first segment is leathery and smooth above, and as long as the two following together; but each of the remaining eleven segments is marked on the back by about three transverse dorsal folds, which terminate on the sides in large, low elevations, pointed-ovate in form (the pointed ends being upwards), one to each segment of the body except the first and the last.

The first spiracle is larger than the remaining eight, and placed between the first and second thoracic segments. The others are situated at the lower ends of the ovate elevations mentioned above, and just within a tortuous longitudinal groove, which separates these elevations from a series of prominent tubercles which extend along the sides, one tubercle to each segment. Still beneath the first mentioned row of tubercles is another longitudinal groove, and a second series of tubercles; and these again are separated from the transverse ventral ridges by still another irregular longitudinal groove. Finally, the ends of these ventral ridges are cut off obliquely by a series of grooves, each extending from before backwards and inwards, thus forming a fourth series of elevations, on a line with the legs.

In *Colaspis*, the elevations of this last series have the form of thick, fleshy tubercles which project downward beyond the general ventral surface, each bearing about ten hairs of varying lengths, the three or four longest of which are longer and stouter than any others on the larva. The hairs on the ventral ridges between these tubercles form an unbroken row. They are about nine in number, alternately longer and shorter, with very many short ones intermingled; the longest being about as long as the corresponding segments. The twelfth ventral segment (fig. 7E) is deeply and widely emarginate posteriorly, divided, in fact, into two triangular plates, between which the unusually developed thirteenth segment appears. These lateral plates are fringed with spines on the posterior two-thirds of their inner margin. The thirteenth or anal segment is likewise longitudinally divided beneath.

These two segments taken together are about one and a half times the length of the preceding one; and their dorsal arches are likewise relatively elongate, being scarcely, if at all, shorter than the next segment in advance.

The legs are about as long as the thoracic segments to which they are attached, and are white, with the exception of the claws, which are dark brown at the tips. They are provided with a few slender white hairs, which become shorter and more spine-like toward the end of the leg.

The head is smooth, somewhat flattened in front, with a few slender, scattered hairs. The clypeus is trapezoidal, and the anterior edge of the labrum (fig. 7D) is convex. The antennae (fig. 7A) are situated just outside the bases of the mandibles. They are minute, white, four-jointed, the two basal joints short and quadrate, the second

and third together as long as the first. The outer distal angle of the third joint is continued as a cylindrical process, which reaches to the end of the joint following.

The mandibles (fig. 7C) are rather narrow (the width being about two-thirds the length), strongly curved, comparatively broad, and obtuse at tip, where they are emarginate, or sometimes trifid. Each bears two long, slender hairs at its outer base.

The cardinal and basal pieces of the maxilla (fig. 7Bc) are not clearly distinct; the maxillary lobe is stout, rounded at the tip, and convex internally, with about ten spines, of varying strength, along the inner margin, the two basal ones being very strong, and about half the length of the lobe. This last extends only a little beyond the second joint of the palpus. The palpi (fig. 7Bd) are prominent and four-jointed, the third joint longest, about equal to the first and second together, and the fourth slender and cylindrical.

The labium (fig. 7Bb) is thick and quadrate, without distinct palpigerous tubercle, and bears on its under surface two slender, cylindrical, unarticulate palpi (fig. 7Ba), which are about as long as the third joint of the maxilla, and taper slightly distally.

Pupa. The pupa is 3.5 mm. long by 2.5 mm. wide; white, except the eyes and the mandibles, which show through the outer envelop red or black.

The front of the head is set with a few long, stout hairs, articulated upon slender, conical tubercles; and three similar rows of hairs appear upon the thorax, one near the anterior border, another near the posterior, and a third intermediate. Six other hairs occur upon the scutellum, and a row of about six or eight borders each one of the abdominal segments above.

The anterior inferior angle of the tibio-femoral articulation of each leg bears a stout, curved hook, that on the first pair of legs being very small. Each of these articulations is likewise armed with two long hairs borne upon slender, conical tubercles. The sheaths of the antennae are tuberculate externally.

The posterior segments of the abdomen are peculiarly armed. The last (fig. 7F) terminates in two simple, incurved hooks, and bears in front of these a pair of stout lateral spines, projecting directly outwards; while a similar but smaller pair of backward-projecting spines is borne by the penultimate.

Life-History.

The imago is said by Dr. Fitch to appear in the latter part of June, continuing through the month of July. Mr. Riley, in his third Missouri report, says that pupation commences in June, the beetles appearing in that month and continuing to issue from the ground until fall

Larvae of this species were first seen by me in southern Illinois on 19 May, at which time they were about half-grown. On 28 June, full-grown larvae and imagos were found in the earth, in strawberry fields, the imagos having, of course, just transformed. Adults again occurred in the earth on 9 July, but by 18 July all had emerged. As early as

the others. The hairs of the median portion of the ridge are separated into two groups by a narrow, median, naked strip. The vent is surrounded by a circlet of ten short hairs. All the hairs of the last four segments are longer and stouter than those preceding; and those of the dorsal surfaces of these segments are likewise more numerous The dorsal arches of the last two abdominal rings are broken into four prominent tubercles, which are sometimes slightly blackened, and bear especially strong spinous hairs.

The eyes are represented by a small cluster of a varying number of pigment specks, situated at less than the length of the antenna above its base.

The antennae are three-jointed, very short, not twice as long as wide, the length of the basal joint being just about its width. The cylindrical process of the penultimate joint is segmented off, forming an apparent accessory article beside the terminal one. The clypeus is about as long as the labrum; and upon the middle of the upper surface of the latter are four long hairs, arranged transversely; and at the inferior edge of the posterior surface are eight strong hooks or spines, projecting inwards and backwards. The maxillary palpi are strong and thick, the two basal joints being broader than long, the third about as long as wide, and the fourth ovate. The tip of the third joint extends scarcely beyond the end of the blade of the maxilla. The latter is not longer than broad, and is armed with about ten stout, blunt spines at its inner margin.

The general form of the mandibles (fig. 6B), seen from above, is triangular, the length being scarcely greater than the width at their base. The tip, seen from beneath, is obtuse and more or less conspicuously emarginate, often decidedly lobed, in which case the lobes are equal. It is never trifid, and never acute. Occasionally this bilobate character of the mandibles is indicated by a longitudinal groove, which scarcely renders the tip emarginate.

The anal segment of this larva is used as a proleg, the grub looping along on a smooth surface after the manner of a phalaenid larva.

Pupa. The pupa may be distinguished by differences in the armature of the posterior segments of the abdomen, especially the last (fig. 6A). This terminates in a pair of brown, chitinous hooks, which curve dorsally, instead of inwards as in *Colaspis*, each being furnished with a strong, erect tooth or spine arising from the upper side of the base. From the middle of the concave margin of each hook springs a long slender hair. The spines in front of these anal hooks project directly backwards. This pupa is further distinguished from that of *Colaspis* by the absence of spines upon the anterior inferior angle of the tibio-femoral articulation of the first and second pairs of legs.

Life-History.

Last April the adult beetles were found not uncommonly in strawberry fields in southern Illinois, having evidently lately emerged from their winter

quarters; but the most careful search of fields infested by root-worms yielded no *Paria* larvae. On 18 May, the adults were again obtained in considerable numbers, by sweeping the foliage of strawberries; and on 15 June a few were seen in the ground about the roots of the plants. On 20 July, larvae and pupae of this species were found among the strawberry roots, adults also occurring on the foliage; and on 26 July all stages were sent me from Lansing, Michigan.

From 1 to 10 August, larvae, pupae and imagos were collected in southern Illinois. On 11 August, the larvae and pupae were noticeably less common than before, but the imagos were now more abundant on the leaves, and several were taken from cavities in the earth. Some larvae and pupae taken from the ground on 1 August, were kept in earth (after careful study of the living specimens for subsequent identification) until they transformed, one beetle emerging on 11 August.

On 24 August, the earth was examined and three more adults were found. These were the last immature examples seen, only scattering adults occurring in our collections during September, October, and November. On 8 December they were taken in abundance under leaves and rubbish on the ground, hibernating in the strawberry fields.

Evidently, here we get no glimpse of a second brood, either early or late, but find the beetles wintering as mature insects, probably laying their eggs in the ground in June, the adults appearing again late in July and in August.

SCELODONTA PUBESCENS Mels.
(Pl. 1, fig. 2.)

The larva and pupa of this species have hitherto remained unknown.

Description.

Larva. The description of the larva of *Paria aterrima*, given above, will answer for this species also, point by point, with the exception of characters drawn from the mandibles (fig. 5C). The tips of these are usually entire, and rather obtuse, although rarely irregularly lobed, or trifid, the central lobe being then much the most prominent. The inner edge of the mandible is excavated on the distal third, like that of *Paria*.

Pupa. (Pl. 1, fig. 3.) The pupa of this species is indistinguishable from that of *Paria*, except by the fact that the terminal hooks of the abdomen (fig. 5 *A*) are smaller, more slender, destitute of the basal spine and of the hair springing from the convex margin.

Life-History.

My first specimens of the larva of this species were obtained in August 1882, two half-grown individuals and one adult beetle occurring in a small collection of insects made at that time in southern Illinois. On 11 September, large and small larvae were found devouring strawberry roots, and a single adult was obtained by sweeping in the field. On 9 November, full-grown larvae were abundant, all having gone into winter quarters in oval cavities in the earth. They occurred at various depths, from 2.5 to 10 cm., and often at con-

siderable distances from the plants on which they had been feeding.

Many hundreds of these larvae were unearthed in November, but not a pupa was found, nor a single adult. Two of the latter were obtained, however, in strawberry fields, in December, showing that a sprinkling of them hibernate as imagos. That it is only a sprinkling was clear, not only from the great numbers of mature larvae of this species in the ground at the time, but likewise from the fact that adults of *Paria aterrima* were then collected by the hundred, although the strawberry roots had been much less seriously attacked by that species than by *Scelodonta*. Early in the following April the larvae were still secure in their subterranean retreats, no pupae yet appearing. On 16 April, two adults were taken, but these were the only ones captured during several days of careful and active field work.

A number of hibernating larvae were placed in boxes of earth at this time, for the purpose of determining the period of their transformations. On 9 May they were found still in their winter condition, but on 20 May pupation was well under way; and about half those in the field were also now in the pupa stage. A thorough search yielded no adults, and no young larvae.

On 7 June, a single adult emerged from those under observation, and the next day three more appeared. The day following, the earth was examined carefully, and fifteen adults were found, all but two still in their cells. With these were three larvae (one of which was dead) and a single pupa. On 15 June, many adults were found in the ground, in the fields, with larvae and pupae, but no adults could be got by sweeping the strawberry vines, and careful search of previously infested fields, made late in July and early in August, yielded but a single imago of this species.

Adults emerging in the breeding cages were observed to feed freely upon the leaves of the strawberry, making small, round holes though the leaf, of about the diameter of their own bodies.

The above data enable us to say definitely that this insect is single-brooded, like its congeners; that it hibernates as a full-grown larva, in oval cells in the earth, a few beetles of the preceding brood likewise sometimes surviving the winter; that the change to pupa occurs in May; and that the adults appear above ground in June. In July, doubtless, the eggs are laid, probably in the ground, the young larvae attacking the roots of the strawberry in that month and in August.

Comparison of Life-Histories.

It will now be interesting and profitable to bring together, side by side, the life-histories of these three companion species.

We have, in these root-worms, three related species, attacking the same part of the same plant in precisely the same way, at the same stage in their development; and strictly dependent upon this plant (as far as is known) for their continued existence. They are, moreover, all native to the region in which they now occur, and have probably fed upon

the wild strawberry from time immemorial.

One would say that here were all the conditions of a most determined struggle for existence, in which one or more of these species must succumb. It is indeed interesting to see how the issue is evaded, and an adjustment reached by which competition is reduced to a minimum. The *Colaspis* larva makes the earliest attack upon the plant, beginning its work upon the root certainly as early as the first of May (half-grown individuals having been taken on the 15th), and finishing in June, all being of full size and preparing to pupate by the end of that month. Next comes *Paria*, in July and August, neither extreme of its period being exactly defined by our observations; and finally comes *Scelodonta*, adults of which were copulating on 1 July, young larvae occurring 7 August. As far as now known, the *Scelodonta* larva is left in undisturbed possession during the remainder of the year; although there is a break in our observations for October. Certainly by November it has completed its work, and retired, full-grown, and ready to transform, into its subterranean cell.

It seems clear, furthermore, that this curious succession of periods is related to a difference of habit with respect to hibernation. Undoubtedly *Scelodonta* winters as a larva, and *Paria* as an adult. As *Colaspis* larvae were only half-grown on 15 May, they very probably hatched from the egg that spring; and as the adult *Colaspis* emerged about two months before the new brood of *Paria*, it seems hardly possible that both could have developed from eggs *laid* that spring; but it is much more likely that *Colaspis* hibernates in the egg. On this hypothesis, we shall have the eggs of *Colaspis* deposited in autumn, those of *Paria* in spring, and those of *Scelodonta* in midsummer, the first species hibernating in the egg, the second as an adult, and the third as full-grown larva, with the necessary result that their attacks upon their common food plant are delivered successively.

The immense advantage derived from this arrangement is evident, when we reflect that by this means as many of *each* of the species are fed upon the surplus structures and supernumerary individuals of the strawberry (that plant being a continuous grower), as it would be possible to maintain of *all three* if they came into simultaneous competition.

COLLECTION AND PRESERVATION OF DIPTERA.

BY SAMUEL WENDELL WILLISTON, NEW HAVEN, CONN.

From dearly purchased experience I have learned the necessity of care in the collection and preservation of entomological specimens, and it may be that a few hints will be of service to the collectors of diptera and similar insects.

For collecting I use a cyanide-bottle.

which, although objected to by European dipterologists, I have found the best and most convenient. But I do not mean an *ordinary* cyanide-bottle, for specimens collected in such are worthless for scientific or other purposes. I select several two ounce [60 c. c.], wide-mouthed bottles of the same form, and carefully line the bottom and sides with a good quality of blotting-paper. Good, firm corks are selected, which are interchangeable in the different bottles: in one of these corks a small hole is made, in which it is better to fit a small metallic ferule; a strip of blotting-paper is then coiled within this cavity, and it is over this that a few drops of a solution of cyanide of potash is poured. It is useless to collect flies in a bare bottle; the insects soon exhale moisture sufficient to ruin them. The blotting-paper prevents this, and the cork can readily be removed from one bottle and put into another when a sufficient quantity of flies is collected. *Moisture of any kind injures flies.* Some flies, such as the hairy *bombyliidae*, should always be pinned when caught. For this purpose a small, tight, pith-lined box may be carried in the pocket, together with a vial of benzine to kill the flies.

In the earlier part of the season many rare specimens of diptera may be obtained by beating. For this purpose a I employ rather heavier net-wire, to which a pointed net of cheese-cloth is attached. On such occasions it is necessary to carry with one a larger bottle with a little cotton-wool in the bottom, and a vial of chloroform in the pocket. By thrusting the end of the net, with its contents, for a few seconds into the chloroform bottle, one can then remove the specimens undisturbed. Very minute flies it is expedient to preserve alive in small bottles filled with paper clippings and through the cork of which a small glass tube is thrust nearly to the bottom. For a collecting net, after many experiments and failures, I have found most serviceable a simple, rather light, brass wire, soldered together to form a ring about 28 cm. in diameter and firmly attached to a light handle about one metre long. The net is made of very coarse bobbinet lace, the most serviceable and, in the end, cheapest material. The net should be readily handled with one hand.

For the collection of diptera a few hints here will suffice. The best season in New England is June, yet specimens may be collected every month in the year. In May and the early part of June, beating will give excellent results. A little later, patches of blackberry (*Rubus*), wild cherry (*Prunus*), dogwood (*Cornus*), Canada thistle (*Cirsium*), or other melliferous blossoms, will afford desirable specimens. It is better to let specimens come to the collector than to go hastily about looking for them. I have spent six hours about a patch of *Cornus paniculata* not ten metres in diameter, and been amply repaid. But few specimens are found in shady woods; those few are to be sought for there. The favorite place for *tabanidae*, as indeed for most

flies, is on the border of woods, open glades, meadow lands, etc.

Specimens should not be allowed to remain over night unpinned. The large specimens may be pinned through the thorax, preferably with japanned iron pins. They should be placed on the pin only low enough so that the head may be grasped with the thumb and forefinger without danger to the specimen. *The wings should never be spread.* Spreading not only renders the specimens more difficult to study, but it spoils the natural appearance of the insects, and is a positive injury to them for the cabinet. All that is necessary is to push aside the wings so that they will not conceal the abdomen. Minute specimens should be pinned with fine iron wire from the underside, and then pinned upon small strips of thin cork, the upper surface of which has been covered with white paper, and through the other end of which a pin is thrust. Small specimens should never be glued to bits of card-board, as is commonly done with coleoptera. Only one specimen should be placed on the piece of cork.

The greatest enemy to dipterological collections is dust: insects can be guarded against, but it is difficult to exclude dust, unless tight cases are used. Dampness and mildew do often much mischief.

A good dipterological specimen must be unrubbed, unmoistened, not dusty nor greasy, and with the wings unspread. It is quite as easy to collect *good* specimens as poor ones and much more satisfactory.

[For other articles on the collection and preservation of diptera, see Rec., 157, 2335, 3396, 3404 and 3405.]

Museum pests of service to the entomologist.—*Trogoderma tarsale* has heretofore been viewed with unmixed hatred by entomologists, but for the last few days I have been showering blessings on the heads of a particular colony which had established itself in a pill-box containing some hundreds of specimens of a pteromalid reared from the cocoons of *Apanteles aletiae* Riley. It is true that nothing but fragments of the pteromalid remained after the *Trogoderma* had been at work for a year or more, but among these fragments I have found a number which illustrate points in the external anatomy better than the most careful dissections. Certain points concerning the form and structure of the metanotum—always hard to study in the complete insect, and very difficult to dissect out, owing to a disagreeable tendency to break through the middle as readily as at a suture—are admirably exhibited by these accidental anatomical preparations. Truly it is an ill wind that blows no good.

L. O. Howard.

Washington, D. C., 25 Jan. 1884.

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PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

(*Continued from p. 116.*)

11 MAY 1883.—The 93rd meeting of the Club was held at 19 Brattle Square, Cambridge, 11 May 1883. In the absence of the President, Mr. S. H. Scudder was chosen Chairman. Three members were present.

The minutes of the last meeting were read and approved. The additions to the library of the Club were announced by the Secretary.

Mr. R. Hayward exhibited a specimen of *Chlaenius tomentosus* taken at Milton, Mass., which varied strikingly from the common form of this insect.

Mr. S. H. Scudder showed a collection of colored figures of insects drawn by Major J. E. LeConte. These figures were a continuation of the collection which was exhibited at the last meeting.

Mr. S. H. Scudder described the habits of *Myrmecophila* and gave a history of specimens previously mentioned as from America. Living specimens of young *M. pergandi*, taken among ants under bark, at Washington, D. C., were shown.

Mr. S. H. Scudder called attention to the eleventh part of W. H. Edwards' "Butterflies of North America" and showed specimens of eggs and larvae of *Lemonias nais*.

Mr. G. Dimmock described a mode of mounting eggs of insects, or other small objects, for the collection, in such a way that they may be examined easily with the microscope. The eggs or other objects are mounted in rings of cork between two thin cover-glasses such as are used for microscope slides. Thus mounted, and sealed with black lac or other means, the specimens can be pinned in the collection with safety and neatness. Specimens can be mounted in Canada balsam in these cork rings, in the way described by Cameron (Proc. nat. hist. soc. Glasgow, 1881-1882, v. 5, pt. 1, p. 4-7), who used, however, paper in place of cork. Cork is lighter than paper, is more convenient for pinning, and can be cut easily intb rings of different sizes with a cork-borer such as is used in chemical laboratories. If circular cover-glasses are used the cells can be sealed neatly on a turntable for preparing microscope slides. Specimens illustrating several styles of mounting were shown.

Mr. A. F. Foerste communicated (through the Secretary) a note upon the fluid thrown out by *Attacus luna* just after it emerges from the chrysalis.

BIOLOGICAL SOCIETY OF WASHINGTON.

14 DEC. 1883. — . . . A paper by Dr. C: V. Riley on "The use of napthaline [sic] in medicine and as an insecticide," was read for Dr. Riley, in his absence, by Dr. W: S. Barnard. It was in the main abstracted from Dr. Ernst Fischer's "Das naphtalin in der heilkunde und in der landwirthschaft . . . . 1883." Naphthalin [$C_{10}H_8$] was first made in 1808. Nothing was said by Dr. Riley of its use in medicine. Its use as a substitute for camphor, for killing museum pests, was suggested in 1840. Placed in insect boxes, it kills acari and psoci, but not other museum pests. Experiments were made with it against *Phylloxera vitifoliae* in 1872. Fischer began ex-

perimenting with it in 1881. It is a better insecticide and cheaper in its crude form than when pure, but is more injurious to plants in that form. It has been applied to grape vines by pouring a kilogram of it in a trench from 15 to 20 cm. deep near the stock of the vine, and then filling the trench with earth.

Dr. T: Taylor said that he had recommended the use of naphthalin for killing phylloxera about ten years ago, and promised to read a paper on the subject at the next meeting of the society. He had not placed the substance in the ground.

Dr. W. S. Barnard said that naphthalin might prove valuable as an insecticide, if made cheap enough and so applied as not to injure the plants. He had devised a method and apparatus by which those insecticides which are dangerous to plants, such as kerosene, cyanide of potassium [KCN], and bisulphide of carbon [CS_2], might be used so as to be safe for the plants and destructive to insects in the ground. These substances have usually been applied on the surface of the ground or buried shallowly, either among the roots or above them, but when brought in contact with the roots, in strength, they kill them. When applied in volatile form they are not so injurious. Naphthalin and kerosene especially should be placed deep below the roots. The apparatus, which Dr. Barnard names a "nether-insertor," consists of a tube which is made to fit closely around a central solid shaft somewhat longer than the tube and pointed at its lower end. The tube may have an internal diameter of 15 mm. and the shaft a diameter of 12 mm. The upper end of the tube expands like a bowl. The upper portion of the shaft is weighted with a heavy ball so disposed that the shaft can be grasped above the ball. By withdrawing this shaft partially from the tube and then returning it with force, as the lower end of the tube rests on the ground, both tube and shaft can be driven into the ground to any required depth. The shaft is then wholly withdrawn and the insecticide poured into the tube, by which means it is placed beneath the roots without coming in contact with them. The tube is then withdrawn, and the hole made by it filled with earth. The insecticide, being volatile, rises through the ground and becomes diffused. With this method of application kerosene is probably superior to naphthalin.

28 DEC. 1883. . . . —DR. T: Taylor read a paper "On naphthaline [sic], its effects on seeds, plants, insects and other animals," describing the results of experiments made by him in 1872 and since. He found that its vapor produced asphyxia in various degrees in different animals. Winged *Phylloxera vitifoliae* were killed almost instantly. Aphides succumbed readily when confined with the vapor. Coleoptera resisted its effects several days. Imagos of *Doryphora decemlineata* died in ten days, but recovered if sooner brought into fresh air. Females of *Calliphora vomitoria* aborted their eggs and then recovered. Flies, bees and wasps were anaesthetized, but recovered if soon brought into fresh air. Ants and termites were killed by the vapor, or were driven away if free to depart. Crickets, roaches, locusts and other insects were driven away. Rats and mice were driven away, and frogs were rendered torpid. Earth worms were driven out of the ground and killed by placing naphthalin in the bottom of a flower-pot where the worms occurred. Insects infesting seeds were killed by enclosing the seeds in jars with naphthalin. Seeds enclosed with naphthalin for two years afterwards germinated, though the odor of the naphthalin was as strong at the end of that time as at the beginning. Three tender plants were kept in an atmosphere of naphthalin vapor for thirty-six hours causing a single leaf on two plants to wilt, and not affecting the third plant. One hour was sufficient to kill the insects on the plants. Naphthalin acts more powerfully when moistened.

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard; S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Bassett, Homer Franklin. To American naturalists. Waterbury, Conn., [*Author*], 1 Mch. 1877. 2 p., 26 × 21.

Request for contributions of specimens of galls, directions for collecting and transporting galls, information about galls. *B: P. M.* (3354)

Bassett, Homer Franklin. Descriptions of several new species of *cynips*, and a new species of *diastrophus*. (Proc. entom. soc. Philad., Dec. 1864, v. 3, p. 679-691.)

Describes galls and imagos of *cynips quercus-formosa*, *c. q.-ventricosa*, *c. q.-ilicifoliae*, *c. q.-majalis*, *c. q.-scitula*, *c. q.-similis*, *c. q.-hirta*, and *diastrophus potentillae*, all new species, and galls of *c. q.-frondosa* and *c. q.-decidua*, both new species, of which the imagos are unknown; describes imagos of *c. q.-batatus* and *c. q.-tuber*, and includes description by C: R. Osten Sacken of imago of *c. q.-strobilana*; gives biological notes on most of these species; *c. q.-singularis* = *c. q.-nubilipennis*. *B: P. M.* (3355)

[**Bassett**, Homer Franklin.] List of North American *cynipidae*. (Amer. nat., Mch. [24 Feb.] 1882, v. 16, p. 246.) (Riley, C: V. Entomology . . . [Mch. 1882], p. 246.)

Rev., by H. F. Bassett, entitled "Arrangement of N. A. *cynipidae* by Dr. Mayr." (*op. cit.*, Apr. [22 Mch.] 1882, p. 329-330.

List of North American *cynipidae* as generically arranged by Dr. G. L. Mayr, of Vienna; comprises 13 genera (including 1 subgenus) and 52 species. *B: P. M.* (3356)

Bassett, Homer Franklin. New species of *cynipidae*. (Can. entom., Mch. 1881, v. 13, p. 51-57.)

Rev., [by C: V. Riley], entitled "Galls and gall-insects." (Amer. nat., May [16 Apr.] 1881, v. 15, p. 402-403.) (Riley, C: V. Entomology . . . [May 1881], p. 402-403.)

Descriptions of galls and imagos of *cynips quercus-californica*, *c. q.-agrifoliae*, *c. q.-suttonii* and *c. q.-nubila*, all new species. *B: P. M.* (3357)

Brandt, Eduard K. Recherches anatomiques et morphologiques sur le système nerveux des insectes hyménoptères, hymenoptera. Comptes rendus de l'acad. des sci. de France, 18 Sep. 1876, v. 83, p. 613-616.)

Separate. [Paris, 1876.] 4 p., 28.5 × 23, t 19 × 12.7.

Eng. transl., entitled, "Anatomical and morphological researches on the nervous system of hymenopterous insects." (Annals and mag. nat. hist., Dec. 1876, s. 4, v. 18, p. 504-506.) [Psyche, Rec., no. 874.]

Study relating to 78 species in the adult stage and 22 larvae. The metamorphoses have been followed in 15 species. Describes the characters of the nervous system in the adult and the larvae and proves that the metamorphosis is accompanied by a coalescence of ganglia. *H. A. R.* (3358)

See also the analysis in Psyche, Rec., no. 874.

C[laypole] E[:] W[aller]. The Colorado beetle. (Can. entom., May 1881, v. 13, p. 115.)

Extract from *Bristol* [Eng.] *mercury*, noting a fine of £5 imposed, in England, for having a living Colorado beetle [*doryphora decemlineata*]. *G: D.* (3359)

Collier, P: Report of the chemist. (Ann. rept. [U. S.] commiss. agric., for 1878. [22 Nov?] 1879, p. 95-156.)

Contains statements (p. 96, 97) that analyses had been made of the white covering of the eggs of *corydalus cornutus*, of so-called bombic acid, and of London purple as a substitute for Paris green as an insecticide; (p. 134, 144) statements of results of these analyses. *B: P. M.* (3360)

Extraordinary cure. (Amer. museum . . . M. Carey, Aug. 1787, v. 2, no. 2, p. 178-179.)

Issue of 42 worms from the ulcerated wounds of a boy who had been impaled on a hay fork. *B: P. M.* (3361)

Farn, A. B. On the diseases of lepidopterous larvae. (Entomologist, April 1882, v. 15, p. 73-75.)

Notes from Pasteur, about the diseases called "pébrine" and "flacherie." *G: D.* (3362)

Fauvel, Albert. Sub judice! Lettre à M. J. B. Géhin. (FAUVEL, A. Annuaire entomologique, 1880, p. 75–85.)

Extract, entitled, "Zum kapitel der varietätenfabrikation." (Entom. nachrichten, 1 July 1880, jahrg. 6, p. 145–146.) [Rec., 2022.]

Criticizes the general naming of varieties of insects. *G: D.* (3363)

Fitch, E: A. External parasites of spiders. (Entomologist, Aug. 1882, v. 15, p. 169-175, 1 fig.)

Figures and describes *polysphincta tuberosa* in several stages; compilation from other authors on the subject. *G: D.* (3364)

Fitch, E: A. Fixity of tenure by a moth. (Entomologist, April 1882, v. 15, p. 91.)

Notes a *taeniocampa gothica* that occupied the same position on a window-frame for three days. *G: D.* (3365)

Fowler, W. W. Water-beetles guided to water by sight, and not by other senses. (Entomologist, Dec. 1883, v. 16, p. 286.)

Water-beetles mistake glass for water. *G: D.* (3366)

French, G: Hazen. A new variety of *catocala*. (Papilio, Dec. 1881, v. 1, p. 218-219.)

Describes as new *catocala robinsonii* var. *curvata*. *H: E.* (3367)

Frey, Heinrich. Jacob Boll, ein schweizerischer naturforscher. (Mitth. d. schweiz. entom. gesells., 1880, bd. 6, p. 47-51.)

Obituary notice of Jacob Boll, b. 29 May 1828, in canton Aargau, Switzerland; d. 29 Sep. 1880, in Wilbarger co., Texas. *S: H.* (3368)

Frost, J. Water-beetles and light reflected by glass. (Entomologist, Dec. 1883, v. 16, p. 286.)

Water-beetles mistake glass for water. Water-beetles possibly carry fish-spawn from one pond to another, thus stocking new ponds. *G: D.* (3369)

Gardner, J. Starkie. Moths attracted by falling water. (Nature, 9 March 1882, v. 25, p. 436, col. 1, 6 cm.) (Entomologist, Apr. 1882, v. 15, p. 96.)

Notice, [by C: V. Riley], with same title. (Amer. nat., Oct. [28 Sep.] 1882, v. 16, p. 826.) (RILEY, C: V. Entomology . . . [Oct. 1882], p. 826.)

Moths seen flying into the great horse-shoe falls near Ljósavatn, in Iceland, attracted by the gleaming of the water as by an artificial light. *G: D.* (3370)

Gibbs, T., *jr.* Hermaphrodite *lycaena alexis*. (Entomologist, April 1882, v. 15, p. 89.)

Record of capture of a hermaphrodite specimen of *lycaena alexis*. *G: D.* (3371)

Giraud, Joseph Étienne *and* Alexandre **Laboulbéne**. Liste d'éclosions d'insectes observées par le Dr. Joseph-Étienne Giraud, member honoraire. Receuillie et annotée par M. le Dr. Alexandre Laboulbène. (Annal. soc. entom. France, 1877, 10 April 1878, s. 5, v. 7, p. 397-436.)

List of 788 hymenoptera and 1 coleopteron observed by Giraud to be parasites upon insects, with statement of the names of the respective insects from which each was obtained. *B: P. M.* (3372)

Gray, Asa. How flowers are fertilized. (Amer. agriculturist, **1876**, **v. 35**: Jan., p. 22; Feb., p. 62; Apr., p. 142-143; May, p. 182; June, p. 222; July, p. 262; Aug., p. 303; Nov., p. 382-383; **1877**, **v. 36**: Jan., p. 22-23; Feb., p. 62-63; Mar., p. 102; May, p. 182.

A series of popular articles on cross and self-fertilization in flowering plants, including the part played by insects in effecting the former. *W: T.* (3373)

[**Gray**, Asa.] Insectivorous plants, 1. (Nation [N. Y.], 2 Apr. 1874, v. 18, p. 216-217.) Correction. (*op. cit.*, 6 Jan. 1876, v. 22, p. 12, note.)

A historical notice of the insectivorous habits of *dionaea*. *W: T.* (3374)

[**Gray**, Asa.] Insectivorous plants, 2. Nation [N. Y.], 9 Apr. 1874, v. 18, p. 232-234.)

A historical notice of the insectivorous habits of *drosera* and *sarracenia*. *W: T.* (3375)

Gray, Asa. Insects and plant fertilization. (Amer. agriculturist, 1866, v. 25: May, p. 186-187: July, p. 257-258; Aug., p. 290-292; Sept., p. 324-325; Oct., p. 362; Nov., p. 400; Dec., p. 437.)

Discusses the pollination of a number of flowering plants, and the part played in it by insects. *W: T.* (3376)

Haase, Erich. Das respirationssystem der symphylen und chilopoden. (Zool. anzeiger, 8 Jan. 1883, jahrg. 6, p. 15-17.)

Anatomical investigations into the respiratory system of *symphyla* and *chilopoda*. *G: D.* (3377)

Hagen, Hermann August. A mystery in reference to *pronuba yuccasella*. (Can. entom., July 1880, v. 12, p. 128-129.)

Crit. rev., by C: V. Riley, entitled "Dr. Hagen's mystery." (Can. entom., Dec. 1880, v. 12, p. 263-264.)

Crit. rev., [by C: V. Riley], entitled "A mystery in reference to *pronuba yuccasella*." (Amer. entom., Dec. 1880, v. 3, n. s., v. 1, p. 293, 16 cm.)

Imagos of supposed *tegeticula yuccasella* obtained from larvae not agreeing with Riley's descriptions, and living in stems of *yucca filamentosa;* these imagos have maxillary palpi like those of *t. yuccasella*. [Later acknowledged to be imagos of *prodoxus decipiens*, and not to have such maxillary palpi.] *B: P. M.* (3378)

Harding, Martin J. Abnormities in butterflies. (Entomologist, Nov. 1883, v. 16, p. 257-258.)

Effect of the attacks of ichneumons and of deficiency of food of larvae in producing deformed butterflies. *G: D.* (3379)

Harding, Martin J. White admiral butterfly; curious abnormity. (Pract. nat., May 1883, v. 1, p. 58, 5 cm.)

A bred specimen of *limenitis sibilla* destitute of the right hind wing. *G: D.* (3380)

Hayward, Roland. A note on *acmaeodera culta*. (Quart. journ. Bost. zool. soc., Oct. 1883, v. 2, p. 56.)

Acmaeodera culta common on flowers of *hypoxys erecta*. *G: D.* (3381)

Hayward, Roland. Rare lepidoptera around Boston during the past summer. (Quart. journ. Bost. zool. soc., Oct. 1883, v. 2, p. 56.)

Notes on *euptoieta claudia* and *papilio cresphontes* from eastern Massachusetts. *G: D.* (3382)

Hellins, J: On the colouring matter, &c., of cocoons of some of the silk-spinning lepidoptera. (Entom. mo. mag., April 1882, v. 18, p. 260-261.)

Discusses the nature of certain substances discharged by silk-producing caterpillars from their anus when spinning their cocoon and used by them to line the cocoon. *G: D.* (3383)

Hellins, J: *Ichneumonidae* infesting larvae of *gyrinus natator*. (Entom. mo. mag., Sept. 1881, v. 18, p. 88-89.)

Two species of *hemiteles*, a *pezomachus* and a *pteromalus* reared from pupae of *gyrinus natator*. *G: D.* (3384)

Hellins, J: On the variable number of moults in larvae from the same batch of eggs. (Entom. mo. mag., Sept. 1881, v. 18, p. 86.)

Records larvae of *orgyia antiqua* that molted three, four, and five times. *G: D.* (3385)

Hoffmeister, August W. [Notes on lepidoptera.] (Can. entom., Sept. 1881, v. 13, p. 196.)

Occurrence and food-plants of *melitaea phaeton* and notes on a few other lepidoptera, observed at Fort Madison, Lee Co., Iowa, in 1881. *A. K. D.* (3386)

Horn, G: H: [Remarks on the species of *cicindela* of the United States.] (Trans. Amer. entom. soc., 1867, v. 1; Record of the meetings, p. 2-3.)

Variations in color and structure of species of *cicindela;* criteria of specific characters in this genus; large series needed for the study of the species. *B: P. M.* (3387)

Jaworowski, Anton. Vorläufige resultate entwickelungsgeschichtlicher und anatomischer untersuchungen über den eierstock bei *chironomus* und einigen anderen insecten. (Zool. anzeiger, 11 Dec. 1882, jahrg. 5, p. 653-657.)

Development of the ovaries of *chironomus* and conclusions based thereon. *G: D.* (3388)

Jenkyns, M. S. Lepidopterous larvae and yellow flowers. (Entomologist, Jan. 1883, v. 16, p. 23.)

Partiality of larva of *heliothis armigera* and of two other lepidoptera for yellow flowers; cannibalism of larva of *h. armigera*. *G: D.* (3389)

Jenkyns, M. S. *Vanessa urticae*. Entomologist, Jan. 1883, v. 16, p. 13-14.)

Records variation in the colors of the pupae of *vanessa urticae* and asks its causes. *G: D.* (3390)

Jones, E. H. Abnormal larva of *melanippe montanata*. (Entomologist, June 1883, v. 16, p. 121, fig.)

Notice, in [C: V. Riley's] "Rare monstrosities" (Amer. nat., Nov. [19 Oct.] 1883, v. 17, p. 1175).

Figures and describes a larva of *melanippe montanata* with developed antennae of the imago. *G: D.* (3391)

Jones, E. H. Hermaphrodite *orgyia pudibunda*. (Entomologist, June 1883, v. 16, p. 135.)

A hermaphrodite *orgyia pudibunda*, with antennae and wings of the male, and body of the female, deposited infertile eggs. *G: D.* (3392)

Jousset de Bellesme.—. Experimental researches on the phosphorescence of the glowworm. (Annals and mag. nat. hist., April 1880, s. 5, v. 5, p. 345-347.)

Eng. tr. of—Jousset de Bellesme's "Recherches expérimentales sur la phosphorescence du lampyre" (Comptes rendus acad. sci. France, 16 Feb. 1880, v. 90, p. 318-321) [Rec., 3394]. *G: D.* (3393)

Jousset de Bellesme,—. Recherches expérimentales sur la phosphorescence du lampyre. (Comptes rendus acad. sci. France, 16 Feb. 1880, v. 90, p. 318-321.)

Abstract. (Rev. scientifique, 28 Feb. 1880, an. 9, p. 835, 13 cm.)

Eng. tr., entitled "Experimental researches on the phosphorescence of the glowworm." (Annals and mag. nat. hist., Apr. 1880, s. 5, v. 5, p. 345-347.)

The presence of oxygen is indispensable to the action of the luminous apparatus of *lampyris*. Every agent which kills the cells immediately arrests the phosphorescence. This appears to be due to the production by the protoplasm under the influence of the will of a phosphorescent substance, probably hydrogen phosphate. *H. A. R.* (3394)

Jousset de Bellesme,—. Sur une fonction de direction dans le vol des insectes. (Comptes rendus acad. sci. France, 8 Dec. 1879, v. 89. p. 980-983.)

Review? ("Guide du natural., an. 2, p. 12-13.")

Extract. (Rev. scientifique, 20 Dec. 1879, an. 9, p. 597-598, 12 cm.)

Description of the mode in which the different orders of insects direct their flight; comparison with the mode of directing flight in birds. It is not the wings, but other parts of the body, which displace the centre of gravity. *G: D.* (3395)

Mik, Josef. Ueber das präpariren der dipteren [Rec., 2335].

Reprint. (Entom. nachrichten, July 1881, jahrg. 7, p. 189-206.)

Notice, [by C: V. Riley], entitled "Preparation of diptera." (Amer. nat., [3] Dec. 1881. v. 15, p. 1008.) (RILEY, C: V. Entomology . . . [Dec. 1881], p. 1008.)

Dutch tr. with additions, by F. M. van der Wulp, entitled "Over het prepareren van diptera. Naar het hoogduitsch van Josef Mik. (Tijdschr. voor entom., jahrg. 1881-1882. deel 25, p. xci-cix, il.)

B: P. M. (3396)

Möller, G. Fr. Bidrag till kännedomen om parasitlifvet i galläpplen och dylika bildningar. (Entom. tidskr., 1882, årg. 3, p. 182-186.)

Engl. tr., by B: P. Mann, entitled "Contribution to the knowledge of parasitic life in galls." (Psyche, Sept.-Oct. [16 Nov.] 1883, v. 4, p. 89-91.)

Lists of insects other than the gall-makers raised from galls of several species of *cynipidae*, in Sweden. *B: P. M.* (3397)

Osten Sacken, C: Robert. Biological notes on diptera. Article 2nd. (Trans. amer. entom. soc., Mch. 1870, v. 3, p. 51-54.)

Additions and correction in author's "Biological notes on diptera, article 3d" (*op. cit.*, Dec. 1871), p. 347.

Describes gall and imago of *asphondylia rudbeckiae-conspicua* n. sp., comparing them with related species, and describes galls and larvae of the new species *cecidomyia sambuci-umbellicola*, *c. caryae-nucicola*, *c. tiliae-citrina* and *c. quercus-majalis*; *callimome advena?* parasitic on the *asphondylia*. *B: P. M.* (3398)

Osten Sacken, C: Robert. Biological notes on diptera, article 3d. (Trans. amer. entom. soc., Dec. 1871, v. 3, p. 345-347.)

Describes imago, abode and transformations of *diplosis resinicola* n. sp., and gall of *cecidomyia cerasi-serotina* n. sp.; seasons of *asphondylia monacha*; further note on *cecidomyia sambuci-umbellicola*.

B: P. M. (3399)

Osten Sacken, C: Robert. Biological notes on diptera. Galls on *solidago*. (Trans. amer. entom. soc., Mch. 1869, v. 2, p. 299-303.)

Enumeration and synopsis of North American dipterous galls on *solidago*; description of galls and imagos of *asphondylia monacha* and *cecidomyia anthophila*, both new species, and of gall of *trypeta polita*, all on *solidago*, with biological notes; generic characters of *asphondylia*. *B: P. M.* (3400)

Osten Sacken, C: Robert. *Lasioptera* reared from a gall on the golden-rod. (Proc. entom. soc. Philad., Feb. 1863, v. 1, p. 368-370.)

Supplementary note, by author, entitled [*Lasioptera solidaginis* and *trypeta solidaginis*]. (*op. cit.*, July 1863, v. 2, p. 77.)

Description of galls of *trypeta solidaginis* and [*eurytychia saligneana*], and of evidences of the presence of other insects in these galls; "does *lasioptera* produce a gall for itself?"; description of imagos of *lasioptera solidaginis* [reared from galls of the *eurytychia*].

B: P. M. (3401)

Riley, C: Valentine. Chinch bug notes. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 87-89.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 87-89 [27-29].)

Verification of Cyrus Thomas' predictions in relation to the ravages of *blissus leucopterus* in 1881 and 1882; extracts from correspondence reporting the abundance of this insect early in 1882; letter from J. G. Barlow on the weather and the ravages of the *blissus* in Washington county, Missouri, in 1882; irrigation, cremation and other means against these insects.

B: P. M. (3402)

Riley, C: Valentine. Gall-insects. (Johnson's new universal cyclop., 1876, v. 2 v. p. 412-416, [16] fig.)

Definition of term "gall-insects;" classification and habits of these insects, mentioning by name and giving figures of typical species and the galls made by them. Dimorphism and metagenesis of *cynips*.

B: P. M. (3403)

[**Riley,** C: Valentine.] Preparation of diptera. (Amer. nat., [3] Dec. 1881, v. 15, p. 1008.) (RILEY, C: V. Entomology . . . [Dec. 1881], p. 1008.)

Notice of J. Mik's "Ueber das präpariren der dipteren" (Verh. k.-k. zool.-bot. ges. Wien, jahrg. 1880, bd. 30, p. 359-378) (Entom. nachr., July 1881, jahrg. 7, p. 189-206) [Rec., 2335 and 3396]. *B: P. M.* (3404)

VAN DER **Wulp,** F. M. Over het prepareren van diptera. Naar het hoogduitsch van Josef Mik. (Tijdschr. voor entom., jahrg. 1881-1882, deel 25, p. xci-cix, il.)

Transl., with additions, of Mik's "Ueber das präpariren der dipteren" (Verh. k.-k. zool.-bot. ges. Wien, jahrg. 1880, bd. 30, p. 359-378) (Entom. nachrichten, July 1881, jahrg. 7, p. 189-206) [Rec., 2335 and 3396].

S: W. W. (3405)

ENTOMOLOGICAL ITEMS.

BULLETIN NO. 3 of the Entomological division of the U. S. Department of agriculture was issued 8 Dec. 1883, and may be obtained on application to the U. S. Commissioner of agriculture at Washington.

THE SECRETARY of the Cambridge entomological club has just published, at his own expense, the minutes of the club's meetings held during 1883. A copy has been sent to every active member of the club.

M. THÉODORE GOOSSENS has announced a memoir to appear in the annals of the French entomological society on the eggs of lepidoptera. With M. Goossens' long experience in rearing lepidopterous larvae this paper will be probably a valuable and interesting contribution to entomology.

MR. W. HAGUE HARRINGTON has presented a list of 926 species of coleoptera taken about Ottawa, Canada, during the past six years, to the Ottawa field-naturalists' club. The list, when published, will contain about 1050 species, there being some yet awaiting determination.

DR. H. A. HAGEN, of Cambridge, Mass., is writing a monograph of the *Odonata* and is desirous of obtaining larvae and pupae of these insects, and especially reared specimens with notes upon their earlier stages.

MR. HENRY EDWARDS, who started and has since edited and published *Papilio*, has transferred that paper to Mr. Eugene M. Aaron, who requests that all communications and business pertaining to *Papilio* be addressed to him, Lock Box 2500, Philadelphia, Pa.

PROF. BERG describes in a late numero of *Kosmos*, how a spider, *Diapontia kochii*, found in Uruguay, uses funnel-formed webs to catch tadpoles for food. In the *American naturalist* for November 1876, T. M. Peters relates the mode by which a species of spider found in Alabama springs upon and captures minnows.

MR. WILLIAM JONES notes, in *Science* for 4 Jan. 1884, that he kept a spider alive in a box without food or drink for 204 days.

LE NATURALISTE CANADIEN, begun Dec. 1868, has just ceased publication, the final numero containing an explanation that the withdrawal of an allowance of $400 heretofore granted it by the government rendered its continued publication impossible.

THE WORLD'S industrial and cotton centennial exposition, which will open early in December 1884, in New Orleans, La., includes in its scope exhibits of useful and noxious insects, and should not be forgotten by entomologists. Further particulars can be obtained by addressing the director general of the exhibition, Mr. E. A. Burke, at New Orleans.

ANY PERSON who considers himself competent to transcribe and to translate into English with accuracy descriptions of insects in dutch, english, french, german, italian, and latin, and has access to extensive entomological libraries, is invited to communicate with Mr. B: P. Mann, at the U. S. Department of agriculture, Washington, D.C., stating the price at which he would be willing to do such work.

THE MINISTRY of the interior of the government of the Argentine Republic, by resolution of 8 September 1883, refused to allow Don Julio Lacroze to import into the country a quantity of grape-vines lying in the custom house at Buenos Aires. This resolution was founded on a previous decree prohibiting the introduction of grape-vines, so as to prevent the development of *Phylloxera vitifoliae.* — *El nacional* [Buenos Aires], 8 Sep. 1883, p. 1, col. 8.

THE FRIENDS of the late Dr. Hermann Müller, of Lippstadt, Germany, have undertaken to establish a fund to honor the memory of Dr. Müller and to aid his family. The fund will be termed the Müller-fund; its revenues will be given to Dr. Müller's widow during her life-time, and after her

death, to some descendant of Dr. Müller who may desire to study natural science, or to some other needy and worthy student of natural science from the school at Lippstadt. Contributions may be sent to the treasurer of the committee on the Müller-fund, Wilhelm Thurmann, City-treasurer of Lippstadt. The undersigned will forward with pleasure, to their destination, any sums he may receive for the fund, together with the names of the givers.

G: Dimmock.

MR. J. B. SMITH prepares his duplicate coleoptera in the following manner:— They are soaked for a week or more in a fluid composed of 100 grams of alum, 25 of salt, 12 of saltpeter, 60 of potash and 10 of white arsenic dissolved in 3000 grams of boiling water. The solution is filtered and when cold add to every ten parts four of glycerin and one of methyl alcohol. Insects prepared in this manner remain soft and flexible and can be sent in boxes without being pinned and without danger of breaking. The same method could be applied to hemiptera and orthoptera, but probably it would not be successful with diptera, hymenoptera, lepidoptera, or neuroptera.— *Science record*, Nov. 1883, v. 2, p. 15-16.

SOCIETY MEETINGS.

THE REGULAR meetings of the Cambridge Entomological Club will be held at 7.45 p. m., on the days following:—

12 Oct. 1883.	14 Mar. 1884.
9 Nov. "	11 Apr. "
14 Dec. "	9 May "
11 Jan. 1884.	13 June "
8 Feb. "	

G. DIMMOCK, *Secretary.*

THE NEW YORK Entomological Club meets twice monthly, except in June, July and August, but no special date is fixed for each meeting.

HENRY EDWARDS. *Secretary.*

THE REGULAR meetings of the Entomological Section of the Boston Society of Natural History will be held at N. W. corner of Berkeley and Boylston Sts., Boston, Mass. at 7.45 p. m., on the days following:—

24 Oct. 1883.	27 Feb. 1884.
28 Nov. "	26 Mar. "
26 Dec. "	23 Apr. "
23 Jan. 1884.	28 May "

EDWARD BURGESS, *Secretary.*

THE REGULAR meetings of the Entomological Section of the Academy of Natural Sciences, of Philadelphia, Pa., will be held at S. W. corner of 19th and Race Sts., on the days following:—

12 Oct. 1883.	14 Mar. 1884.
9 Nov. "	11 Apr. "
14 Dec. "	9 May "
11 Jan. 1884.	13 June "
8 Feb. "	

JAMES H. RIDINGS, *Recorder.*

THE SEMI-ANNUAL meetings of the American Entomological Society will be held at S. W. corner of 19th and Race Sts., Philadelphia, Pa., on the days following:—

10 Dec. 1883.	9 June 1884.

JAMES H. RIDINGS, *Recording Secretary.*

THE REGULAR monthly meetings of the Montreal Branch of the Entomological Society of Ontario, will be held at Montreal, Que., Canada, on the days following:—

2 Oct. 1883.	5 Feb. 1884.
6 Nov. "	4 Mar. "
4 Dec. "	1 Apr. "
8 Jan. 1884.	6 May "

G. J. BOWLES, *Secretary.*

THE MONTHLY meetings of the Brooklyn Entomological Society will be held in the rooms of Wright's Business College, Broadway, corner of Fourth Street, Brooklyn, E. D., the last Saturday of each month except July and August.

F. G. SCHAUPP, *Secretary.*

No. 115-116 were issued 11 Feb. 1884.

some years since, and which has proved of great value for freeing the orange groves of the scale insects. I allude to its emulsification with milk and water, whereby petroleum can be diluted to any suitable strength for insecticide purposes. The emulsion applied by a brush upon the parts where winter eggs are deposited will destroy them. When diluted, a spray of it over the entire plant in the winter season will do no harm. The winter eggs should be treated not later than February. The milk-kerosene process permits petroleum to be applied by the ordinary methods for insecticides. Emulsification with milk is also a recourse to slow and milden the intense action of the petroleum naphthas when placed in the ground.

Petroleum should be sprayed over the ground to destroy scattered eggs, and to reach the superficial larvae in the soil, but not, when undiluted, so as to flow undiffused upon the roots. When gradually dispersed above as spray and when inserted beneath the roots, the ground itself practically dilutes and diffuses the petroleum before it can reach the roots. The nether-upward kerosene diffusion process is the only economically practical way, of course, in which the deep application of the undiluted forms of petroleum can be attempted with safety to the plant. By it the cheap, crude article and its lighter form, the naphthas, become available as most valuable agents against the pests.

The nether-kerosene process applies likewise as a treatment against all other root insects or subterranean pests, as for example, the American blight aphid [*Schizoneura lanigera*] the hop root gortyna [*Gortyna immanis*], root maggots of the cabbage, &c., the strawberry root beetles, cicadas, cut-worms, white grubs, wire worms, nests of ants, &c. Thus it is seen to have a general application to a wide range of cases heretofore not satisfactorily treated.

Besides the combined application of petroleum and the nether-insertion process, the latter and the inserters apply in combination with many other insecticides which have more or less efficiency in the cases cited, of which the following examples may be specially mentioned, viz.: rhigolene, gasolene, naphtha, benzine, kerosene, crude petroleum, oil of tar, tar water, naphthalin, pyroligneous acid, soot, creosote, carbolic acid, cresylic acid, sulphurous acid, sulphocyanide of potassium, bisulphide of carbon, cyanide of potassium, pyrethrum preparations, lye solutions, tobacco decoction, chips and snuff, water, gas water, liquid fertilizers, vapors, gases or fumes. The relative merits or advantages or disadvantages of these would involve lengthy discussion which may now be postponed, each has its special adaptation.

The nether inserters apply any upward acting insecticide against any underground enemies. Also I have provided certain accessories with which they in the same manner apply water or liquid manure to saturate the ground against *Phylloxera* or the other pests, and to fertilize the ground, to stimulate and diet up the plant; but these topics will be fully noticed at a later date.

THE FIRST NUMERO OF THOMAS SAY'S AMERICAN ENTOMOLOGY AND TWO LETTERS ON THE HESSIAN FLY HITHERTO NOT MENTIONED AMONG HIS PUBLISHED PAPERS.

BY DR. HERMANN AUGUST HAGEN, CAMBRIDGE, MASS.

I bought, in 1850, out of the library of the late W. Von Winthem, in Hamburg, the first numero of Say's American entomology, 1817; the first volume of his American entomology, 1824; and the glossary, 1825. All three are in the original binding and the two latter with the inscription on the title: "To Mr. Wm. W. von Winthem from his friend the author." All belong now to the library of the Museum of comparative zoology.

The first numero of volume 1 of the Amer. entomology, 1817, is extremely rare; indeed I have never seen another copy than mine in Europe or in America, and was also assured by the best authority, Mr. S. H. Scudder, that he had never seen a copy. Dr. J. L. LeConte, in his edition of Say's works, 1859, v. 2, p. 1, note, says: "These references are to the suppressed first edition of the American entomology, which I have never seen." Later, in 1872, when I showed my copy to the late Doctor, he answered that he possessed a similar copy. Perhaps my memory is wrong; at least in the printed catalogue of his library it is not mentioned.

I suppose some details about this rare book may not be out of place. Say, in the preface of vol. 1, 1824, p. vii, says: "Six plates of the present volume, together with their accompanying text, were printed off in the year 1817, but as they were never properly published, it has been thought advisable to include them in the present work."

The little volume is printed on the same paper and same size as vol. 1, 1824; the cover has the same nice vignette (two Cupids catching insects), but marked vol. 1, no. 1, and Kneass, Young and Co. etc., which is also repeated on the title plate. The title is American | Entomology | or | Descriptions | of the | Insects of North America | illustrated by | Coloured Figures | from | Drawings executed from nature | by Thomas Say | Member of the Academy of Natural Sciences of Philadelphia etc. | (the verses from Stillingfleet as in 1824) Philadelphia | published by Mitchell and Ames | W. Brown, Printer, Prune Street. | 1817.—

Then follows, p. iii to x, a preface entirely different from that in 1824.

The six plates have no numero nor the name of the engraver, exactly as in volume 1, 1824, where the same six plates are alone not numbered.

1. *Papilio Philenor*, with three pages of text, marked Plate I (the same numero in 1824).

2. *Geotrupes Tityus*, with 4 pages of text, marked Pl. II (*Scarabaeus Tityus*, pl. 4, in 1824).

3. *Nemognatha immaculata*, with 2 pages of text, marked Pl. III (pl. 7 in 1824).

4. *Notoxus monodon*, the lower fig., and *N. bicolor*, with 4 pages of text, marked Pl. IV (*Anthicus bicolor* and *A. monodon*, pl. 10, in 1824).

5. *Berytus spinosus*, with 3 pages of text, marked Pl. V (pl. 14, in 1824).

6. *Cicindela formosa, and C. decemnotata*, with 4 pages of text, marked Pl. VI, and followed by an index of the 8 species figured (pl. 18 in 1824).

The text in 1824 is throughout different from the text in 1817, mostly shortened, but scarcely different for the descriptive part of the species. The coloration of the plates is more careful than in 1824 and better than in LeConte's edition.

The Memoirs of the Philadelphia society for promoting agriculture, vol. 4, Philadelphia, 1818, 8°, contain two letters of Thomas Say, which are not mentioned in Doubleday's List of Thomas Say's works, nor in LeConte's edition, nor quoted by Th. W. Harris. Dr. Asa Fitch states that he has never seen this rare book. The volumes were presented to the Library of Harvard college in 1849, after Harris had done his work. He knew it, but as it contains nothing of importance it is not quoted by Harris, though in one volume a letter to him is found on the cover.

1. A letter, Sept. 28, 1817, to Hon. R. Peters, by Thomas Say, p. 224-226, containing remarks on the Hessian fly, on the locust and on corn grubs.

2. A letter, p. 236-237, to the same, by Thomas Say, containing remarks on the Hessian fly, on *Tinea granella*, and on cut worms.

[The references to these two articles, which were written out several years since, are added in the Bibliographical record, nos. 3430 and 3431.—*B. P. M.*]

SOUND-PRODUCING ORGANS IN ANOMALA, ANTHONOMUS, AND OTHER COLEOPTERA.—There is a stridulating organ in *Anomala*, situated on the metathorax and elytra, in the same position as described by me in *Polyphylla* (PSYCHE, v. 2, p. 278). Its location is the same as that of the elytral organ described by Dr. LeConte (Class. col. N. A.) in *Trox* and *Ligyrus*, but Dr. LeConte failed to notice that the metathorax in those genera has on its ascending portion (beneath a ridge in *Trox*) a corresponding pearly space, just as it has in *Polyphylla;* this is in addition to the organ on the first ventral, corresponding to the third dorsal, segment, in *Trox*, described by Dr. LeConte. My finding these organs in *melolonthini* and *rutelini* is merely accidental: why does not some coleopterist study them microscopically in all our genera of *scarabacidae?* The same organs are present in *Limonius* and other *elateridae*, and there is, besides, a surface on the ascending portion of the first ventral segment, as in *Trox*, which, as in *Trox*, corresponds to a second surface on the elytra. I find stridulating organs also in *Anthonomus*, of the *curculionidae*, situated as in *Anomala*.

W. H. Patton.

Waterbury, Conn., 13 Nov. 1883.

[Stridulating organs of coleoptera are described in PSYCHE, Rec., no. 1406, 1444.]

PSYCHE.

CAMBRIDGE, MASS., MARCH 1884.

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PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

(*Continued from p. 133.*)

8 JUNE 1883.—The 94th meeting of the Club was held at 19 Brattle Square, Cambridge, 8 June 1883. In the absence of the President, Mr. R. Hayward was chosen Chairman. Five persons were present.

Mr. S. H. Scudder reviewed P. H. Gosse's "On the clasping organs ancillary to generation in certain groups of the lepidoptera" (Trans. Linn. soc. Lond., April 1883. Zool.: s. 2. v. 2. pt. 6. p. 265–345. pl. 26–33) and described the general structure of the genitalia of lepidoptera, giving the nomenclature of these parts according to Gosse and according to other authors. [For further notice of this review see *Science*, 6 July 1883. v. 2, p. 22-23.]

Mr. G. Dimmock exhibited a living specimen of *Buthus occitanus*, and described some of the habits of that species of scorpion. The specimen shown was taken near the Arago Laboratory, at Banyuls-sur-mer, Pyrénées-Orientales, France, in May 1882.

Mr. R. Hayward showed a male specimen of *Rhyssa atrata*, and some discussion followed on the comparative rarity of the males and females of certain hymenoptera.

Mr. G. Dimmock said that after repeated attempts he had succeeded in making the male of *Culex* drink. The structure of the mouth-parts of the male had led the speaker to believe that the male mosquito could drink altho it could not bite us and thus get at our blood, and by keeping a male without drink for several days he had had the satisfaction of seeing the insect drink water freely from a moist cloth.

THE LARGE number of references to galls and gall-insects in the Bibliographical record, recently, are brought together in answer to inquiries from correspondents. We have many more on hand, not yet complete enough to print in the record, but sufficient for immediate use. Having brought together, in the course of years, by diligent labor, an immense stock of references, partially indexed, we are prepared to supply such to correspondents, in manuscript. We deem it no more than just to require such correspondents to pay for the assistance thus rendered them, either in kind or in money which may be applied to defraying the expenses of PSYCHE.

B. P. M.

LONDON LETTER.

EAST DULWICH, LONDON,
JANUARY 5th, 1884.

One of the most important and extensive contributions to a knowledge of the Japanese entomological fauna has recently been received in this country from the hands of Mr. Geo. Lewis. This gentleman, having made a no inconsiderable collection during a previous sojourn in Japan, returned to that country for the express purpose of supplementing and increasing the same, and being an experienced British collector was thus enabled to bring home a magnificent series of coleoptera, neuroptera and rhynchota. The coleoptera in several families have already been treated by Messrs. Bates, Gorham and Lewis; the neuroptera have been handled by Baron de Selys-

Longchamps, and I have given a first report on the rhynchota, an order of which some Japanese members have previously received the efficient attention of your own countryman, Mr. P. R. Uhler. We have no state aid to entomology in this country, and our success in the study of the science has always been largely indebted to the voluntary efforts of those votaries who possess the love of entomology combined with the necessary leisure and competence to undertake or promote such expeditions.

Herr Georg Semper, of Altona, who has recently paid us a visit, has informed me of his intention to publish a work on the rhopalocera of the Philippine Islands, for which he possesses good material in the collection made by his brother Prof. Carl Semper during his memorable journey to those islands. Another work of this nature is in the press, viz., a new edition, with much new matter, of Mr. Trimen's "Rhopalocera Africae australis."

We are still having a very mild winter, resembling in this respect its immediate predecessors. It is probable, therefore, that the ensuing summer may also follow its recent precursors in exhibiting a considerable dearth in insect life, as the complaints of lepidopterists and other collectors in our entomological magazines during the last few years abundantly testify. The mild, damp winters are well known to be destructive to pupating insect life, but these do not explain the more difficult and interesting problem as to the sudden and plentiful appearance in one season of a generally scarce and almost unobserved species. This is not confined to temperate climates, as I have lately received a very forcible illustration of the same phenomenon in the tropics. *Ragadia crisia* Hübn., a well known and handsome member of the *satyrinae*, is not a scarce insect in the Indo-Malayan region, though it has hitherto been unrecorded from the Malay peninsula. I did not meet with it, when residing and collecting there myself, some fifteen years ago, nor have I received it since, in numerous collections derived from that locality. Last year, however, the species seems to have been common from Penang to Singapore. I first received two specimens captured on Penang Hill, and sent me as a new species; others shortly followed from Province Wellesley, with the remark of an experienced collector that the species was quite new to the locality; and almost simultaneously the Indian mail brought me more examples from Sungie, Ujong, Malacca and Singapore.

For some years past, owing to the demands of foreign institutions, entomological literature has reached a pecuniary value that has rendered its acquisition by many students a matter of some inconvenience and difficulty. At recent sales, held in London, of the books of deceased naturalists, these high prices have failed to obtain, and we may hope that prices may soon be less prohibitory to those working entomologists to whom a library of reference is a real necessity.

Mr. Edward Whymper, who paid a visit to Ecuador in 1879-1880, where he made a considerable collection in natural history, especially in regard to entomology, is now writing the account of his journey, which will shortly be published. A feature of this work will be a scientific appendix giving the details and identifications of his collection, contributed by a body of specialists who have undertaken this work. The entomological collection is not very large, but its interest and biological importance is due to the fact that many of the specimens were collected in very high altitudes, and thus contrast with those found in the hot, tropical valleys.

In my previous letter (v. 4, p. 94) the name "Dr. Leitner" should be spelled "Dr. Leuthner."

W. L. Distant.

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard; S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Gerber, Armand. Conservation des collections entomologiques. (Feuille des jeunes naturalistes, 1 Dec. 1880, an. 11, p. 30-31.)

Discusses the merits of the essence of bitter almonds ($C^6 H^5$, COH) and the essence of mirbane, or nitrobenzole ($C^6 H^5$, NO^2) for keeping collections of insects free of pests. *G: D.* (3406)

Illinois state laboratory of natural history, *Normal, Illinois — Director, 1881-1882* (Stephen Alfred Forbes). Report of the director of the state laboratory of natural history, for the two years, ending June 30, 1881, and June 30, 1882. [Normal, Ill., Mch. 1883.] t.-p. cover, n. t.-p., 12 p., 23 × 15, t 18 × 11.

Report of progress made in the different kinds of work of the Illinois state laboratory of natural history. Considerable space is devoted to the work in branches of economic entomology. *G: D.* (3407)

Osten Sacken, C: Robert. [*Lasioptera solidaginis* and *trypeta solidaginis*.] (Proc. entom. soc. Philad., July 1863, v. 2, p. 77.)

Note supplementary to author's "*Lasioptera* reared from a gall on the golden-rod" (*op. cit.*, Feb. 1863, v. 1, p. 368-370) [Rec., 3401]; *lasioptera solidaginis* bred from galls [of *eurytychia saligneana*] on *solidago* and similar galls on *vernonia; trypeta asteris* || Harris = *t. solidaginis* Fitch; it is not certain that this fly makes galls on *aster*. *B: P. M.* (3408)

Riley, C: Valentine. Conical galls on leaves of wild grape-vine. (Moore's rural new-yorker, 28 Aug. 1869, v. 20, p. 555, col. 3-4, 12 cm.)

Brief description of galls [of *cecidomyia vitis-viticola*]; characters of larvae of *cecidomyia*. *B: P. M.* (3409)

[**Riley**, C: Valentine.] Covering of egg-puncture mistaken for *dorthesia*. (Amer. nat., July 1881, v. 15, p. 574.

In the collection of Asa Fitch the white and ribbed waxy material covering the egg-punctures of *enchophyllum binotatum* are labelled as *dorthesia viburni* and *d. celastri*. It is doubtful whether any such species were described by Fitch. *B: P. M.* (3410)

[**Riley**, C: Valentine.] Cypress-gall. (Amer. entom. and bot., June 1870, v. 2, p. 244, 19 cm., fig. 153.)

Description and figures of gall and description of larva and imago of *cecidomyia cupressi-ananassa* on *cupressus "thyoides"* [*disticha*]; figure of breast-bone of larva. *B: P. M.* (3411)

Riley, C: Valentine. Dr. Hagen's mystery. (Can. entom., Dec. 1880, v. 12, p. 263-264.)

Crit. rev. of H. A. Hagen's "A mystery in reference to *pronuba yuccasella*" (*op. cit.*, July, p. 128-129) [Rec., 3378]; the remarks in that article are admitted by Dr. Hagen to have been founded upon the confusion of *prodoxus decipiens* with *tegeticula yuccasella*. *B: P. M.* (3412)

Riley, C: Valentine. On a gall-making genus of *apioninae*. (Bull. Brooklyn entom. soc., Oct. 1883, v. 6, p. 61-62.)

Separate. [Brooklyn, N. Y., 1883.] 2 p., 23 × 15.

List of gall-making coleoptera hitherto found in North America; description of the new genus *podapion* and of the gall and imago of *p. gallicola* n. sp., found on twigs of *pinus inops;* probable life-habits, inquilines and parasite of this insect. *B: P. M.* (3413)

[**Riley**, C: Valentine.] Gall on *solidago* leaves. (Amer. entom., Nov. 1880, v. 3, n. s., v. 1, p. 278, 4 cm.)

Letter from H. Barnes, with answer; occurrence of galls of *cecidomyia carbonifera* on leaves of *solidago nemoralis?* at Mulberry Corners, Ohio. *B: P. M.* (3414)

[**Riley**, C: Valentine.] Galls. (Amer. entom. and bot., Dec. 1870, v. 2, p. 372, 3 cm.)

Notice of author's studies on North American gall-insects, and request for specimens and notes upon that subject. *B: P. M.* (3415)

[**Riley**, C: Valentine.] Galls and gall-insects. (Amer. nat., May [16 Apr.] 1881, v. 15, p. 402-403.) (Riley, C: V. Entomology . . . [May 1881], p. 402-403.)

Review of H. F. Bassett's "New species of *cynipidae*" (Can. entom., Mch. 1881, v. 13, p. 51-57) [Rec., 3357], with additional notes on the gall of *cynips quercus-californica;* this gall found on *quercus douglasii*, and infested by *ozognathus cornutus* even after it has been dried for years; the *cynips* produced from it all females; reference to earlier accounts of the gall and of the habits of the *ozognathus*. *B: P. M.* (3416)

Riley, C: Valentine. [On galls growing on wild sage.] (Trans. acad. sci. St. Louis, [July ? 1873], v. 3; Journ. of proc., p. 84.)

[Verbal communication, 3 June 1872.] Occurrence of three distinct, undescribed galls on *artemisia tridentata* in Utah. *B: P. M.* (3417)

Riley, C: Valentine. Galls made by moths. (2d ann. rept. state entom. Mo., [Mch.] 1870, p. 132-135, fig. 98-99.)

Contains, by C: V. RILEY:—The false indigo gall-moth: *walshia amorphella*, Clemens [Rec., 3339]. The misnamed gall-moth: *eurytychia, saligneana*, Clemens [Rec., 3343]. *B: P. M*, (3418)

[**Riley**, C: Valentine.] Galls on *eucalyptus*. (Amer. nat., May [16 Apr.] 1881, v. 15, p. 402.) (Riley, C: V. Entomology . . . [May 1881], p. 402.)

Probable character of two galls occurring on *eucalyptus gracilis* in Australia, and described by R: McLachlan. *B: P. M.* (3419)

[**Riley**, C: Valentine.] Large *asilus* fly. (Amer. entom. and bot., Oct. 1870, v. 2, p. 340, 4 cm.)

Food-habits of *promachus vertebratus*, *p. bastardii* and *asilus missouriensis;* occurrence of undetermined galls under trees of *quercus alba*. *B: P. M.* (3420)

[**Riley**, C: Valentine.] Mite gall on sugar maple. (Amer. entom. and bot., Oct. 1870, v. 2, p. 339, 4 cm.)

Brief description of gall of *acarus aceris-crumena* n. sp., on leaves of *acer saccharinum;* occurrence of similar galls of *acarina* on plum and cherry. *B: P. M.* (3421)

[**Riley**, C: Valentine.] Mossy rose gall. (Amer. entom. and bot., May 1870, v. 2, p. 213, 12 cm., fig. 130.)

Description of gall, larva and imago of *rhodites rosae* and of larva of a parasite on it; figure of the gall. *B: P. M.* (3422)

[**Riley**, C: Valentine.] Moths attracted by falling water. (Amer. nat. Oct. [28 Sep.] 1882, v. 16, p. 826.) (RILEY, C: V. Entomology . . . [Oct. 1882], p. 826.)

Notice of J. S. Gardner's "Moths attracted by falling water" (Nature, 9 Mch. 1882, v. 25, p. 436) [Rec., 3370]; gleaming water-falls in Iceland as attractive to moths as artificial light would be. *B: P. M.* (3423)

[**Riley**, C: Valentine.] "A mystery in reference to *pronuba yuccasella*." (Amer. entom., Dec. 1880, v. 3, n. s., v. 1, p. 293, 16 cm.)

Crit. rev. of H. A. Hagen's "A mystery in reference to *pronuba yuccasella*" (Can. entom., July 1880, v. 12, p. 128-129) [Rec., 3378]; Hagen confounded *prodoxus decipiens* with *tegeticula yuccaesella* in his article, and published no correction of the error after he found it out. *B: P. M.* (3424)

Riley, C: Valentine. Oak apple. (Amer. cyclop. . . . Appleton, 1875, v. 12, p. 558-559, 3 fig.)

Describes galls of *cynips terminalis*, *c. quercus-spongifica* and *c. quercus-inanis*, and manner in which they are formed; figures the latter two galls and a parent fly; nature of galls; problems involved in the study of gall-insects. *B: P. M.* (3425)

[**Riley**, C: Valentine.] Oak gall: *cynips q.-decidua* Bass. (Amer. entom., Nov. 1880, v. 3, n. s., v. 1, p. 278, 4 cm.)

Letter from J. Schneck, with answer; galls supposed to be those of *cynips q.-decidua* found on leaves of *quercus muhlenbergii* at Mt. Carmel, Ill. *B: P. M.* (3426)

[**Riley**, C: Valentine.] Pithy blackberry gall. (Amer. entom., Mch. 1870, v. 2, p. 159-160, 24 cm., fig. 103.)

Description and figures of larva and gall of *diastrophus nebulosus* on *rubus;* figure of pupa; seasons, guest-fly (*aulax sylvestris*) and parasite [*eurytoma diastrophi*] of the *diastrophus;* the genus *diastrophus* confined to *rosaceae*, *cynips* to *cupuliferae* and *antistrophus* to *compositae*. *B: P. M.* (3427)

[**Riley**, C: Valentine.] The pod-like willow gall. (Amer. entom. and bot., May 1870, v. 2, p. 214, 14 cm., fig. 133.)

Description and figures of gall of *cetidomyia salicis-siliqua*, figure of larva; food-plants, synonymy and description of pupa of this gnat. *B: P. M.* (3428)

[**Riley**, C: Valentine.] Prickly rose gall. (Amer. entom. and bot., June 1870, v. 2, p. 246, 3 cm.)

Brief description of gall of *rhodites bicolor* on wild rose. *B: P. M.* (3429)

Say, T: Hessian fly; grain moth; cut worm. (Memoirs Phil. soc. promot. agric., 1818, v. 4, p. 236-237.)

Cecidomyia destructor oviposits in stubble of old wheat; the "grain-moth" may be *tinea granella* of Europe; the parents of cut-worms probably oviposit at the roots of grass. *B: P. M.* (3430)

Say, T: Season of 1816. (Memoirs Phil. soc. promot. agric., 1818, v. 4, p. 224-226.)

Cecidomyia destructor unknown in Europe; *cicada septendecim* not a locust; "corn-grubs" are larvae of various species of *noctua*. *B. P M.* (3431)

[**Tepper**, F: *and* E: L: **Graef.**] Synoptic table of lepidoptera. (Bull. Brooklyn entom. soc., May 1879, v. 2, p. 5-6, 1 fig.)

Synoptic table of species of the genus *colias*. Cont. from *op. cit.*, Mar. 1879, v. 1, p. 89-90. *F. G: S.* (3432)

Worthington, C: Ellis. Two new hesperians. (Papilio, Sept. 1881, p. 132-133.)

Describes as new *eudamus oberon* and *erycides okeechobee*, both from Marco Island, Fla. *H: E.* (3433)

ENTOMOLOGICAL ITEMS.

WORCESTER, MASS, has a new scientific society, the Zoological club of Worcester, of which Mr. F. G. Sanborn is president.

MR. D. W. COQUILLETT, of Anaheim, California, has in view the preparation of a monograph of the dipterous family *bibionidae*.

MR. WILLIAM BUCKLER, who has described the early stages of a large number of British lepidoptera, died 9 Jan. 1884, at Lumley House, Emsworth, Hants, in his seventieth year.

IT MAY interest entomologists to learn that the newly organized American ornithologists' union have a committee to consider whether the English sparrow (*Passer domesticus*) is on the whole beneficial or injurious to agriculture. The committee has issued a circular asking answers to questions on the subject.

AT A meeting to which the entomologists of Washington and Baltimore were invited, held at the house of Dr. C: V. Riley, in Washington, D. C., on the evening of 29 February 1884, and presided over by Rev. Dr. John G. Morris, of Baltimore, a resolution was adopted unanimously to establish an entomological society in Washington and vicinity, and a committee was appointed to draw up the necessary regulations and to call a future meeting for organization.

B: PICKMAN MANN, *Secretary*.

THE CORNELL UNIVERSITY offers to its students "final honors" in entomology, as in several other subjects, and under the following conditions, which we extract from "The Cornell university register 1883-84," p. 111:—

Entomology.—The candidate must have passed, with an honorable average, the regular examinations in the subjects of zoölogy (vertebrate and invertebrate), microscopic technology, botany (the elementary course, including field-work), and entomology (the general course, as laid down in the sophomore and junior years in the course in agriculture); and must also pass, with distinguished excellence, a special examination upon the results of an investigation of one or more special subjects to which he has devoted an amount of work equivalent to two hours a term for two years.

The subject for 1884 is to be selected from the following list:

(*a*) The internal anatomy of the larva of the *Corydalus cornutus* Linn.

(*b*) The insects injurious to woolen goods in the United States.

(*c*) The insects infesting apple trees at Ithaca.

(*d*) The insects injurious to wheat in the north-eastern part of the United States.

NEW SCIENTIFIC journals are springing up with about the same prolificacy, and with almost the same prospect of long life, as is the case with French political newspapers. We have before us the third numero of "Random notes on natural history" published by Southwick and Jencks, of Providence, R. I., from which we discover the existence of a Rhode Island entomological society. From the first (March) numero of "Problems of nature," to be published semi-monthly at New York, under the editorship of H. P. Philbrook, we learn still less. We learn that Mr. Winfrid A. Stearns, of Amherst, Mass., proposes to start a monthly journal, to be devoted to the interests of Massachusetts natural history, and to be called the "Bulletin of the natural history of the state of Massachusetts." We can decide better upon the merits of this bulletin with a long name, after we see a copy of it. Its price is one dollar a year, and it is approved and aided by the officers of the State agricultural college at Amherst.

Many enthusiasts wish practically to promote the natural sciences by publications, they can do better by increasing the effectiveness of established journals than by wasting their energies in overcoming the friction of numerous new machines, for each separate journal requires as much unproductive labor in its merely mechanical working as all combined would need, while the same energy concentrated on one working machine would all be utilized.

THE JANUARY numero of the *Deutscher bienenfreund* contains an interesting article on Professor R. Leuckart of Leipzig university, with special reference to his contributions to our knowledge of bees. The article, which is accompanied by a full-page portrait of Prof. Leuckart, was written by Dr. Oskar Krancher, lately a student in Leuckart's laboratory. As Leuckart, who is now sixty years old, has done much excellent work for entomology in the midst of his extensive zoological investigations, and has been the teacher of many young zoologists wno have studied the anatomy of insects, I may be pardoned for translating a part of what Dr. Krancher truly says of the secret of his ability as an educator. "One needs only to be present at a single lecture to discover the reason for this extraordinarily large attendance. Animated diction, eminent gift of eloquence, pleasant, flexible tenor voice, knack at experimenting, finally the gift of teaching and explaning in the clearest manner, these faculties combine to make Leukart one of the best instructors of Leipzig university." "In his laboratory he proves himself the true 'friend' of the students, now and then taking active hold in the tasks of the several workers." *G. D.*

SOCIETY MEETINGS.

THE REGULAR meetings of the Cambridge Entomological Club will be held at 7.45 p. m., on the days following:—

12 Oct. 1883.	14 Mar. 1884.
9 Nov. "	11 Apr. "
14 Dec. "	9 May "
11 Jan. 1884.	13 June "
8 Feb. "	

G. DIMMOCK, *Secretary.*

THE NEW YORK Entomological Club meets twice monthly, except in June, July and August, but no special date is fixed for each meeting.

HENRY EDWARDS. *Secretary.*

THE REGULAR meetings of the Entomological Section of the Boston Society of Natural History will be held at N. W. corner of Berkeley and Boylston Sts., Boston, Mass. at 7.45 p. m., on the days following:—

24 Oct. 1883.	27 Feb. 1884.
28 Nov. "	26 Mar. "
26 Dec. "	23 Apr. "
23 Jan. 1884.	28 May "

EDWARD BURGESS, *Secretary.*

THE REGULAR meetings of the Entomological Section of the Academy of Natural Sciences, of Philadelphia, Pa., will be held at S. W. corner of 19th and Race Sts., on the days following:—

12 Oct. 1883.	14 Mar. 1884.
9 Nov. "	11 Apr. "
14 Dec. "	9 May "
11 Jan. 1884.	13 June "
8 Feb. "	

JAMES H. RIDINGS, *Recorder.*

THE SEMI-ANNUAL meetings of the American Entomological Society will be held at S. W. corner of 19th and Race Sts., Philadelphia, Pa., on the days following:—

10 Dec. 1883.	9 June 1884.

JAMES H. RIDINGS, *Recording Secretary.*

THE REGULAR monthly meetings of the Montreal Branch of the Entomological Society of Ontario, will be held at Montreal, Que., Canada, on the days following:—

2 Oct. 1883.	5 Feb. 1884.
6 Nov. "	4 Mar. "
4 Dec. "	1 Apr. "
8 Jan. 1884.	6 May "

G. J. BOWLES, *Secretary.*

THE MONTHLY meetings of the Brooklyn Entomological Society will be held in the rooms of Wright's Business College, Broadway, corner of Fourth Street, Brooklyn, E. D., the last Saturday of each month except July and August.

F. G. SCHAUPP, *Secretary.*

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PSYCHE,

A JOURNAL OF ENTOMOLOGY.

[Established in 1874.]

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APRIL 1884.

CONTENTS:

ADVERTISEMENTS 154
THE BIBLIOGRAPHY OF ENTOMOLOGY. Annual Address of the Retiring President of the Cambridge Entomological Club, 11 January, 1884—*Benjamin Pickman Mann.* 155-159
SEXUAL ATTRACTION IN PRIONUS—*Anna Katherina Dimmock* 159
PROCEEDINGS OF SOCIETIES—Cambridge Entomological Club 160
BIBLIOGRAPHICAL RECORD, no. 3434-3454 161-162
ENTOMOLOGICAL ITEMS—Society Meetings 163-164

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PSYCHE.

THE BIBLIOGRAPHY OF ENTOMOLOGY.

ANNUAL ADDRESS OF THE RETIRING PRESIDENT OF THE CAMBRIDGE ENTOMOLOGICAL CLUB, 11 JANUARY 1884.

Fellow Members of the Cambridge Entomological Club:—

I thank you for the honor you were pleased to confer upon me a year ago, in electing me to be your president, an office which to my regret I could fill only in name. I look upon this action of yours as a recognition of my interest in your work and of my earnest endeavors to promote it. My absence from your meetings has not weakened my devotion to the cause which under your auspices I have sought, during the last ten years, to advance.

Ten years of the life of the club have expired, in which the membership of the club has enlarged and grown in influence. A bright future is before us if we only strive in unison to carry out the purposes for which our club was formed, in the most liberal spirit, giving, and trusting for the returns.

I need not dwell upon retrospect nor prophecy. You know the past, and you have the future in your own control.

I welcome this opportunity, dictated by custom and by your laws, to express my thoughts upon that part of our work as a club with which I have been most concerned. It will not seem to you unnatural for me to speak of the Bibliography of entomology, its purposes and its methods. I will not go into its history, for I prefer rather to consider its future.

We are fortunate in having in our midst and reckoning as one of our number the prince by excellence of the bibliographers of entomology. We count also amongst our members others who have rendered efficient service in this useful and laborious art. One can hardly think of the Cambridge entomological club without thinking of PSYCHE or of PSYCHE without thinking of its Bibliographical record. We are therefore prepared in an especial manner to appreciate the importance of bibliographical work as applied to the promotion of science.

The need of such work is evidently felt in these days more than ever before. Since we entered upon our work we have seen bibliographical departments established as an important feature in

many periodical publications, and some such publications established, as PSYCHE was, mainly for the sake of their bibliographical departments.

Bibliography is not a science and yet without it the sciences would fare hardly in these times. By it the hidden treasures of acquired knowledge are brought to light. Without it the advance of knowledge would be slow. The ever increasing mass of literature is a wilderness, which no one can traverse throughout, into which few can penetrate deeply, in whose recesses are scattered, with little order, the gathered riches of innumerable workers. He who would not spend his life in doing anew what has been done before him, and often well done, must have access to these acquired stores. Without guides he would become lost, he would find little of that for which he seeks and in the search would lose his time and his way. The index is to the traveler in this wilderness more than the compass to the mariner. It is the guiding hand which leads him from store to store, and places at his disposal all that he wants, or points out to him the empty coffers yet to be filled. Thus are his labors spared and his strength saved for the work that is yet to be done.

I presume that you all are bibliographers, in varied degrees. You have your several studies, and you make your several indices in relation thereto. You are interested to promote the formation of indices of which you may make use, or by which you may render service to others. I have labored long, as you know, to construct a bibliography, not so much of any specialty in entomology, as of the subject as a whole.

We have many bibliographical publications at our service now, for the record of current literature. Such works of frequent issue as the *Zoologischer anzeiger* and the *Naturae novitates* serve an excellent purpose for temporary use. By them little of value escapes mention. Their form and style are not suited, however, to the characteristics of a permanent and comprehensive bibliography. In their bibliographical department they are little more than lists of writings, without those references to reviews, extracts and reprints, which serve for the history of literature, and which have a more than bibliographical value. They are not adapted for ready reference by means of indices, and indeed hardly pretend to be more than temporary guides to current literature, for the especial benefit of those workers who are ever tumbling over each other in their haste to get at the latest development of science, and to move forward.

The annual records, such as the Zoological record and the Zoologischer jahresbericht, are more than bibliographies in their essential features, but less in others. They too give lists of titles, but without the bibliographical descriptions. The bibliography, such as it is, is almost buried in the mass of the reviews. These works are not so much guides to literature as contributions to it, themselves requiring guides. They treat of the substance of the literature more than of its form, and this so copiously that in the course of years

they become like forests themselves, the trees indeed planted in rows, but those of one kind so far apart and interspersed with others, that they can only be found by a tedious search.

I do not wish to seem to find fault with these works. I recognize their value for the purposes of their being. I only say of them that they have not certain characteristics which they do not pretend to have. We have yet to find the bibliography that we need, permanent, complete, limited to bibliographical simplicity and convenient of reference.

For the early literature there is no need to attempt to improve upon Hagen's Bibliotheca entomologica.[1] My remarks apply to literature subsequent to that there recorded, including such omissions from and corrections of that work as occasion may present. The time may come in which a supplement to that work will be published, in some similar form, supplanting all lesser bibliographies, as that has supplanted all earlier ones. Until that time the best that we can do is to form a current bibliography, upon a simple and uniform plan, adapted to serve all the varied purposes which are to be sought in such a work. It may seem superfluous for me to attempt to describe the principles upon which I think such a work should be constructed.

You have granted me so great liberty in the editorial management of PSYCHE that I have been enabled, as improvements in the form of the bibliographical record have been suggested, to put them into practice. I am largely indebted to my principal colaborer in the editorship for many of these improvements. Many changes have been made and probably many others will be made, but the essential features have so far remained the same throughout. Hagen's Bibliotheca served as a model in the beginning, and except in detail little change has been made since.

It is useless in a current bibliography to preserve any classification of matter. In the early volumes of PSYCHE the attempt was made to bring together the whole contents of volumes in a continuous record, but the disadvantages of the plan were found to overbalance its advantages. In such a plan the whole contents of a volume must be held back until the volume is finished, and other works which are connected with the former by cross-references must be postponed to them. This plan has few advantages, moreover, as reference is rarely made to the contents of works by volumes. In later volumes of PSYCHE little or no attempt has been made at the classification of matter.

The whole problem of classification is solved by the publication of the record in form suitable for the construction of card catalogs. The only feature of the work which is marred by the card catalog arrangement is the sequence of the current numeros used for the purposes of the index.

Some persons will choose to arrange their card catalogs by subjects, and others in chronological order, but I have

[1] Psyche, Rec., no. 3306.

found the most convenient arrangement to be that by authors, alphabetically and with titles arranged alphabetically under the names of the authors, the index being relied on for reference by subjects or in any other manner desirable. This requires, so long as the index is made by the use of the current numeros, the preservation of a copy of the record in its original form.

During the past three years I have been engaged, amidst other duties, in writing that bibliography of economic entomology which was projected by the United States entomological commission in 1881,[1] and was turned over to the United States Department of agriculture upon the extinction of the commission. This I have prepared strictly in accord with the methods adopted in PSYCHE, and I have hopes that it may appear so, when published. It has been necessary to index this in large part in advance of its publication, and while yet it was in process of formation, so that the current numeros were not yet attached to it. Under these circumstances the reference has been made in every case by the citation of the name of the author and of the title of the article. This method of reference, though less compact than the mere citation of a numero, has the advantage of being universally applicable, wherever the title may be found under the author's name.

The convenience of reference by a single series of numeros to the whole of the bibliography, however extensive it may become, seems to me one of the most desirable features to be embodied in such a work.

One of the greatest objections to the annual records of literature, or to any other partial bibliography, from a bibliographical standpoint, is in the necessity, there present, of consulting many indices to find all the references to a single subject. No other form of reference is so compact, so definite and by so easily understood a symbol, as a simple numerical reference. With such means of reference available, new indices, complete to date, can be published from time to time, more readily than under any other circumstances.

I have now sketched briefly to you a few thoughts upon the desirable features of a permanent, complete, simple bibliography, convenient of reference. I have assumed that the characteristics of such a bibliography, are to be found in PSYCHE. It is true that the Bibliographical record of PSYCHE is not complete, but that is not the fault of its plan; only the misfortune of its circumstances. However unreasonable it may be to hope that these circumstances will yet so change, that the record in PSYCHE may be made complete, I still hope it may see better days: If I am not astray in my appreciation of it, it will at least serve as a model.

I hope yet to see an index to the literature of entomology, which will embody the features I have set forth, or better ones. Such a work could well be undertaken in connection with the work of some scientific station where entomology is a special feature, and which is provided with the necessary means

[1] Circular 12 of U. S. entomological commission, January 1st, 1884.

for its accomplishment. And if so undertaken and carried out, it should be a work which could be pointed at with pride. I would fain see this club the author of it.

I would gladly have contributed to your meeting a more worthy address, but beg you to remember that if not felicitous of speech I am constant of heart, and shall ever wish you prosperity and good fellowship in your future.

Respectfully,

B: Pickman Mann.

SEXUAL ATTRACTION IN *PRIONUS*.

BY ANNA KATHERINA DIMMOCK, CAMBRIDGE, MASS.

Late in the summer of 1883 my attention was drawn to the sudden appearance of a large number of holes in the garden, which, upon closer observation, proved to be the exits of numerous beetles of the genus *Prionus*. Having heard that the attraction of the male by the female was not common among coleoptera, and finding no notice of such attraction in the above-mentioned coleoptera, I captured a large female which was found in the grass with ovipositor distended and greatly protruded. Scarcely had the female been secured before a male *Prionus* appeared; he ran and flew, by alternation, meanwhile rapidly palpitating his antennae, about and around the tent, inside of which the female had been confined; finally, discovering the entrance to the tent, he flew in and lit directly on the screen under which the female had been put. After the appearance of the first male another was seen to approach the tent. He went through a similar performance to that of the first one, finally alighting on the cage. In this manner a great many male specimens of *Prionus* were taken in the course of an afternoon. On account of the presence of so many males a number of females made their appearance, showing an attraction of the female to the male like that above-noted of males attracted by females. Instances similar to those just described, that is, of male insects attracted by females of the same species, have been frequently recorded in lepidoptera, especially among the *bombycidae;* but among the coleoptera such cases are, I think, more rarely met with, the only instance to my knowledge being the one originally mentioned by Prof. F. H. Snow,[1] and quoted by Mr. J. A. Lintner.[2] Prof. Snow found males of *Polyphylla variolosa* vigorously scratching the ground above places where females were about to emerge, presumably guided to these places, as Mr. Lintner suggests, by the sense of smell, rather than, as Prof. Snow supposed, by that of hearing.

The most remarkable part of the sexual attraction manifested by *Prionus* is that of the females being attracted by the males, a kind of attraction concerning which I have found no notice whatever.

2 Mar. 1884.

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[1] Trans. Kans. acad. sci., 1874, p. 27-28.

[2] Lintner, 1st ann. rept. insects N. Y., 1882 [1883], p. 71.

PSYCHE.

CAMBRIDGE, MASS., APRIL. 1884.

Communications, exchanges and editors' copies should be addressed to EDITORS OF PSYCHE, *Cambridge, Mass. Communications for publication in* PSYCHE *must be properly authenticated, and no anonymous articles will be published.*

Editors and contributors are only responsible for the statements made in their own communications.

Works on subjects not related to entomology will not be reviewed in PSYCHE.

For rates of subscription and of advertising, see advertising columns.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

(*Continued from p. 147.*)

12 OCT. 1883. — The 95th meeting of the Club was held at 19 Brattle Street, Cambridge, 12 Oct. 1883. In the absence of the President, Mr. S. H. Scudder was chosen Chairman. Four persons were present.

The Secretary announced the reception of a box containing a brood of young larvæ of *Papilio philenor*, in fine condition. The Secretary received no clue as to the name of the sender, the box having written on it only, "*Papilio philenor*, Staten Island, June 18th 1883."

Messrs. Hayward, Sprague, and Dimmock announced captures of rarer diurnal lepidoptera in Massachusetts. [See *Psyche*, Sept.–Oct. 1883, v. 4, p. 99–100.]

Mr. S. H. Scudder made some remarks upon fossil species of *Raphidia* and *Inocellia* from the Florissant Basin, in Colorado. The one species of *Raphidia* and four species of *Inocellia* differ structurally from living forms. One species of *Inocellia*, not differing structurally from those found living, has been found in amber.

The Secretary read a letter from Miss Eleanor C. Scott, of Flushing, N. Y., who inquired in regard to a very small luminous insect. None of the members present could give information about the insect without a fuller description than the one sent.

Mr. S. H. Scudder announced the death of Prof. Oswald Heer, of Zurich, Switzerland, well known as an author upon fossil insects and plants. Mr. Scudder showed a photograph of Prof. Heer and made some remarks upon his works.

9 Nov. 1883. — The 96th meeting of the Club was held at 19 Brattle Street, Cambridge, 9 Nov. 1883. In the absence of the President, Mr. R. Hayward was chosen Chairman. Three members were present.

Mr. G. Dimmock read a paper "On some glands which open externally on insects," illustrating the paper with a few specimens of insects having such glands. [The paper is published in *Psyche*, v. 3, p. 387–401.]

Mr. R. Hayward exhibited specimens of *Bolitotherus bifurcus*, and called attention to the pubescence on the posterior femora and on the horns, and to the length of the carina of the head, all secondary sexual characters of the male of this species.

Mr. S. H. Scudder made some remarks on G. B. Buckton's "Monograph of British aphides," of which the fourth volume has just appeared.

14 DEC. 1883. — The 97th meeting of the Club was held at the Secretary's house, 54 Sacramento Street, Cambridge, 14 Dec. 1883. In the absence of the President, Mr. R. Hayward was chosen Chairman. Five persons were present.

The Secretary announced the withdrawal from the Club of Mr. T. J. Mathews, of Grayville, Ill., who had written that on account of increase in his business he had no time now to devote to entomology; also the withdrawal of Mr. A. P. Chadbourne, of Cambridge, Mass.

Mrs. A. K. Dimmock showed a collection representing stages of 38 species of insects which are found upon *Betula alba*, the white birch. [An account of this collection will be given in *Psyche*.]

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard: S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Lubbock, J: On flowers and insects. (LUBBOCK, J: Scientific lectures, Lond. and N. Y., *Macmillan*, 1879, p. 1-30, fig. 1-30.)

Treats of the cross-fertilization of plants and the modes by which it is accomplished; rapidity of visits of wasps and bees in collecting honey; color sense in bees. *G: D.* (3434)

Lubbock, J: On the habits of ants. (LUBBOCK, J: Scientific lectures, Lond. and N. Y., *Macmillan*, 1879, p. 68-96, fig. 45.)

Treats of the metamorphoses, food, domesticated *aphides* and other insects in the nest, enemies and modes of warfare, industry, longevity, association with one another, slavery, division of labor, intelligence, engineering, recollection of associates, smell, hearing, sight, and communities of ants. *G: D.* (3435)

Lubbock, J: On the habits of ants: *continued*. (LUBBOCK, J: Scientific lectures, Lond. and N. Y., *Macmillan*, 1879, p. 97-137, fig. 46-51.)

Treats of the absence of affection for one another, recognition of associates, hatred of strangers, agricultural skill (exemlipfied by *pogonomyrmex barbatus*), cooperation, power of communication (compared with that of bees and wasps), power and mode of finding their way (compared with that of bees and wasps), ability or absence of ability to produce and hear sounds, and power of discriminating colors, of ants, ending with a comparison of the advancement among different kinds of ants to "the three great phases: the hunting, pastoral and agricultural stages, in the history of human development." *G: D.* (3436)

Lubbock, J: On plants and insects. (LUBBOCK, J: Scientific lectures, Lond. and N. Y., *Macmillan*, 1879, p. 31-67, fig. 31-44.)

Treats of the use of honey by plants as an attraction for flying insects, in order to secure cross-fertilization, and as an attraction for ants, to act as protectors for the plant; structures to keep ants out of flowers; modifications of insects to imitate plants, and thus escape enemies; forms and colors of larvae do not depend upon those of the mature insect, but upon larval habits; richness of adaptive modifications illustrated by a brief description of the transformations of *silaris;* protective coloration of lepidopterous larvae, especially of *sphingidae*. [Most of the facts in regard to the larvae of *sphingidae* are, according to author (p. 52), from Weismann's "Studien zur descendenz-theorie. II. *G: D.* (3437)

Lubbock, J: Scientific lectures. Lond. and N. Y., *Macmillan & co.*, 1879. 12+188 [+ adv.] p., il.; 1, pl., 23X14.5, t 17X9.8. cl., $2.50.

Notice. (Nation, 16 Oct. 1879, v. 29, p. 262.)

Rev. (Westminster rev. [Amer. ed.], Oct. 1879, p. 287-288, 48 cm.)

Rev. (Amer. journ. sci. and arts, Nov. 1879, s. 3, v. 18, p. 418.)

Rev. by A. R. W[allace], entitled "Lubbock's Scientific lectures." (Nature, 7 Aug. 1879, v. 20, p. 335-336, 38 cm.)

Contains six lectures, by author, with following titles, *which see:* — 1. On flowers and insects [Rec., 3434], p. 1-30. — 2. On plants and insects [Rec. 3437] p. 31-67. — 3. On the habits of ants [Rec., 3435], p. 68-96. — 4. On the habits of ants: *continued* [Rec., 3436], p. 97-137. — 5 and 6 [not entomological]. *G: D.* (3438)

Müller, Hermann. Die bedeutung der honigbiene für unsere blumen. [No. 1-9.] (Eichstädter bienenzeitung, **1875, v. 31**: 15 Apr., p. 81-82; 15 May, p. 102-104; 31 May, p. 109-111; 15 June, p. 122-125; 15 July, p. 138-141; 31 July, p. 165: **1876, v. 32**: 31 Jan., p. 20-22; 1 June, p. 119-123; 15 July, p. 176-184.)

Abstract of nos. 8-9, by H. Müller, under full title. (Bot. jahresbericht . . . Just, 1876, v. 4, p. 946, 7 cm.)

A series of nine articles, as follows: 1. The Sprengel-Darwinian theory of flowers. 2. The adaptation of *lanium album* to *bombus*. 3. The mutual adaptations of *bombus* and flowers which it visits. 4. The gradual development of the pollen-baskets of *apis*. 5. Gradual correlated increase in the care for their young, and in the pollen-bearing efficiency of *tenthredinidae, cynipidae, ichneumonidae* and *sphegidae*. 6. The care of certain *sphegidae* (*pompilus*) for their young. 7. What bees have inherited from lower hymenoptera, and what they have acquired for themselves. 8. Statistical comparison of the floral activity of lower hymenoptera. 9. Statistical comparison of the floral activity of the lower and higher bees. *H. M.* (3439)

Müller, Hermann. Die stellung der honigbiene in der blumenwelt. 1. (Bienen-zeitung, 15 Jan. 1882, jahrg. 38, p. 22-24.)

Records the visits of *apis mellifica* to anemophilous flowers. *W: T.* (3440)

Ormerod, Eleanor A. Effects of warmth and surrounding atmospheric conditions on silkworm larvae. (Entomologist, June 1882, v. 15, p. 127-129.)

Experiments upon the effects of temperature and moisture in rearing *bombyx mori*. *G: D.* (3441)

P[ackard], A[lpheus] S[pring, *jr.*]. The insects of May. (Amer. nat., May 1867, v. 1, p. 162-164, 3 fig.)

Figures *carpocapsa pomonella*, *phyllobrotica vittata*, and *conotrachelus nenuphar*, and gives brief notes on many other insects. *G: D.* (3442)

Osten Sacken, C: Robert. Dimorphism of female *blepharoceridae*. (Entom. mo. mag., Feb. 1881, v. 17, p. 206.)

Notice of private letter from F. Müller, proving "three facts, new to the student of *blepharoceridae*: 1, that male and female do not always have the head and the front of the same structure; 2, that some species may have two forms of females; 3, that one of these forms has the organs of the mouth built upon a plan different from the type hitherto described as peculiar to the female." *B: P. M.* (3443)

Patton, W: Hampton. Description of the species of *macropis*. (Entom. mo. mag., July 1880, v. 17, p. 31-35.)

Describes *macropis ciliata* n. sp., and *m. patellata* n. sp., and varieties of the former; remarks upon the criteria of species in this genus, and upon the distinctness of the forms hitherto described as separate species in Europe. *B: P. M.* (3444)

Reuter, Odo Morannal. Diagnoses quatuor novarum pentatomidarum. (Entom. mo. mag., Mch. 1881, v. 17, p. 233-234.)

Describes 2 new species of *carbula* from the Amur and China, *edessa fuscidorsata* n. sp. from Mexico and Bogota, and *aspongopus nigroaeneus* n. sp. from Siam. *B: P. M.* (3445)

[**Riley**, C: Valentine.] Galls on supposed dock. (Amer. entom. and bot., May 1870, v. 2, p. 212, 4 cm.)

Gelechia gallae-solidaginis forms galls on stems of *solidago*; *gastrophysa cyanea* breeds on *rumex*. *B: P. M.* (3446)

[**Riley**, C: Valentine.] Raspberry gouty gall. (Amer. entom., Feb. 1870, v. 2, p. 128, 11 cm., fig. 90.)

Ravages of and means against *agrilus ruficollis*; description and figure of larva. *B: P. M.* (3447)

[**Riley**, C: Valentine.] Raspberry root-gall. (Amer. entom. and bot., Apr. 1870, v. 2, p. 181, 13 cm., fig. 110.)

Description and figure of gall of *rhodites radicum*, occurring on roots of *rosaceae* and especially of *rosa*; genera of parasites raised from it; interest of the question of the manner and extent of parasitization of this gall. *B. P. M.* (3448)

[**Riley**, C: Valentine.] Rose-gall and pupa of archippus butterfly. (Amer. entom. and bot., Sep. 1870, v. 2, p. 307, 7 cm., fig. 189.)

Figure of pupa of *danais archippus*; brief descriptions of three undetermined species of galls on rose-leaf, doubtless all formed by *rhodites*. *B: P. M.* (3449)

Riley, C: Valentine. The solidago gall moth: *gelechia gallaesolidaginis*, n. sp. (1st ann. rept. state entom. Mo., [Mch.] 1869, p. 173-178, fig. 96-97; pl. 2, fig. 1-2, 5-9.)

Occurrence of galls of *trypeta* (*acinia*) *solidaginis* on stems of *solidago nemoralis*; description and figures of gall, larva and imago of *gelechia gallaesolidaginis* and of imagos of *pirene?* n. sp., *eurytoma bolteri* n. sp., and *hemiteles? cressonii* n. sp.; description of imago of *microgaster gelechiae* n. sp., and mention of *pimpla* n. sp. and *ephialtes* n. sp., all these being parasites on the *gelechia*; seasons, habits, food-plants [*solidago* spp.] and geographical distribution of the *gelechia*, and habits of the *pirene?*, *hemiteles?* and *microgaster* and of an intruding larva perhaps of *oberea* sp.; comparison of the *gelechia* and its gall with *cochylis hilarana* and its gall on *artemisia campestris* in France. *B: P. M.* (3450)

[**Riley**, C: Valentine.] The trumpet grape-gall. *Vitis viticola*, O. S. (Amer. entom., Feb. 1870, v. 2, p. 113-114, 19 cm., fig. 76.)

Reprint of figure of gall figured in [B: D. Walsh *and* C: V. Riley's] "The trumpet grape-gall" (*op. cit.*, Sep.-Oct. 1869, p. 28) [Rec., 3353], fig. 27, under the name of *vitis-lituus*; this gall previously described as that of *cecidomyia viticola*; occurrence of similar gall in England, on *tilia* probably caused by mites. *B: P. M.* (3451)

[**Walsh**, B: Dann *and* C: Valentine **Riley**.] An apple growing on a grape vine. (Amer. entom., Oct. 1868, v. 1, p. 28, 12 cm.)

Extract from *Richmond* [Va.] *whig*, with criticism; a gall of *cecidomyia vitis-pomum* mistaken for an apple growing on a grape-vine. [Further accounts of the same given in (authors') "The apple growing on a grape vine" (*op. cit.*, Nov. 1868, p. 54) (Rec., 3453), and in (authors') "Galls and their architects" (*op. cit.*, Feb. 1869) (Rec., 3349), p. 106.] *B: P. M.* (3452)

[**Walsh**, B: Dann *and* C: Valentine **Riley**.] The apple growing on a grape vine. (Amer. entom., Nov. 1868, v. 1, p. 54, 7 cm.)

The "vegetable phenomenon" described in [authors'] "An apple growing on a grape vine" (*op. cit.*, Oct. 1868, p. 28) [Rec., 3452] proved to be a gall [described and figured as that of *cecidomyia vitis-pomum* n. sp., in (authors') "Galls and their architects" (*op. cit.*, Feb. 1869) (Rec., 3349), p. 106]. *B: P. M.* (3453)

[**Walsh**, B: Dann *and* C: Valentine **Riley**.] Oak-leaf gall. (Amer. entom., Sep.-Oct. 1869, v. 2, p. 29, 22 cm.)

Description of galls of *cecidomyia quercus-pillulae* and *c. q.-[p.-symmetrica]*; occurrence of *cynipidae* as guests in galls of *cecidomyidae*; difference between larvae of *cynipidae* and *cecidomyidae*; transformations of *cecidomyia q.-pillulae* and of the *cynips* inquilinous in its gall; distinction of the annual and biennial groups of *quercus* and of the galls occurring on trees of the one or the other group. *B: P. M.* (3454)

ENTOMOLOGICAL ITEMS.

THE NATURAL history society at Springfield, Mass., proposes to begin an insect collection.

M. ADRIEN DOLLFUS, the editor of the *Feuille des jeunes naturalistes*, at 35, rue Pierre-Charron, Paris, France, desires to exchange European *oniscoda* for American species.

THE JANUARY numero of the *American college directory*, published at St. Louis, Mo., contains a portrait of Dr. C: V. Riley, of Washington, D. C., with a brief notice of his life.

THE DOLLFUS prize of the French entomological society is awarded, for the year 1883, to M. Ernest André, for his work entitled "Spéciès des formicides d'Europe et des pays limitrophes."

DR. GRASSI has found that flies fed with materials which contain eggs of worms leave these eggs in their excrement, and that consequently meat which was exposed to the visits of the flies could help in distributing parasites.

IN THE November session of the zoological section of the Westfälischer provincialverein für wissenschaft und kunst, Mr. Pütt showed the crop of a pheasant which was full of larvae, about 15 millimetres long, belonging to some species of diptera. There were 411 larvae in the crop.

IT IS announced that the Russian grand-duke Nikolai Michailowitsh, eldest son of grand-duke Michail, intends to issue in parts a fine work under the title "Mémoires lépidoptérologiques," the basis for which will be his own large collection of lepidoptera, rich in species which he collected in the Caucasus.

WE LEARN from the *Entomologist's monthly magazine* that the Ray society has acquired the late Mr. William Buckler's drawings of the larvæ of British macrolepidoptera, together with the voluminous manuscript which accompanies them, and they will probably form the subject for three or four volumes of the society's publications.

DR. H. A. HAGEN, in a letter to *Science* for 11 April 1884, shows that the Hessian fly was known by that name in the United States before the Revolution. Quotations are given from the minutes of the American philosophical society of Philadelphia, as early as 18 May 1768, where the committee on husbandry was "to consider whether any method can be fallen upon for preventing the damage done to wheat by the Hessian fly."

IN A brief summary of the European species of lepidoptera with apterous or subapterous females, by Dr. R. C. R. Jordan, in the *Entomologist's monthly magazine* for March 1884, it is shown that wingless lepidoptera exist in the following families: *heterogynidae*, *arctiidae*, *hepialidae*, *psychidae* (all species), *liparidae*, *noctuidae* (one species, *Ulochlaena hirta*), *geometridae*, *pyralidae* (part of the females of *Acentropus niveus*, which oviposit under water), *tortricidae*, *tineidae*, and *talaeporidae*.

DR. LAYET, of Bordeaux, has studied an eruptive disease to which workers in a large vanilla warehouse in that place are subject, and found that the disease is caused by a little insect (*Acarus*) which is found upon the outer end of the vanilla capsules. The insect does not bore into the skin, but causes the irritation by contact, aided perhaps by the mechanical action of acicular crystals which are upon the outside of the capsules.

THE POISONOUS properties of carbon disulphide [CS_2] have been investigated by a number of doctors in California. The results show that continued breathing of carbon disulphide produces derangement. As is well known, carbon disulphide has been extensively used in the wine-producing districts of California against phylloxera, and a number of workmen, who were engaged in the wine districts, have become insane.—*Deutsch-amer. apoth.-zeitung, 15 Feb. 1884, p. 736.*

THE NUMERO of the *Entomologist* for March 1884 contains a note entitled "Description of a *Pieris* new to science.—*Pieris spilleri*, mihi. By A. J. Spiller," in which Mr. Spiller

writes "As the insect is not in the Cape or British museum collections, and is unknown to collectors of exotic insects who have examined it, and as Dr. Staudinger has pronounced it to be a new and interesting species, I beg therefore to name it after myself." Mr. Spiller may be congratulated on the delicacy of the compliment he has received in having the species thus named after him.—*G: D.*

MR. J. J. WALKER, writing, in the *Entomologist's monthly magazine* for March 1884, of Pitcairn Island, that curious little inhabited island in the Pacific near Tahiti, which, although only two and a quarter miles long by less than one mile wide, rises to a height of 1000 feet above the sea, says: "No butterfly is apparently found on the island, and I saw only a few common Tahitian moths; but I found, for the first time, the large yellow-striped green larva of *Choerocampa erotus* on the 'Nono' plant, and a good many living pupæ of *Sphinx convolvuli* (equal in size to English specimens) were brought to me, having been found in the patches of sweet potatoes, of which a supply was then being dug up for the ship. Four species of coleoptera (a *Tomicus?*, two cossonid weevils, and a rhizophagoid?) occurred rarely."

SOCIETY MEETINGS.

THE REGULAR meetings of the Cambridge Entomological Club will be held at 7.45 p. m., on the days following:—

12 Oct. 1883.	14 Mar. 1884.
9 Nov. "	11 Apr. "
14 Dec. "	9 May "
11 Jan. 1884.	13 June "
8 Feb. "	

G. DIMMOCK, *Secretary.*

THE NEW YORK Entomological Club meets twice monthly, except in June, July and August, but no special date is fixed for each meeting.

HENRY EDWARDS, *Secretary.*

THE REGULAR meetings of the Entomological Section of the Boston Society of Natural History will be held at N. W. corner of Berkeley and Boylston Sts., Boston, Mass. at 7.45 p. m., on the days following:—

24 Oct. 1883.	27 Feb. 1884.
28 Nov. "	26 Mar. "
26 Dec. "	23 Apr. "
23 Jan. 1884.	28 May "

EDWARD BURGESS, *Secretary.*

THE REGULAR meetings of the Entomological Section of the Academy of Natural Sciences, of Philadelphia, Pa., will be held at S. W. corner of 19th and Race Sts., on the days following:—

12 Oct. 1883.	14 Mar. 1884.
9 Nov. "	11 Apr. "
14 Dec. "	9 May "
11 Jan. 1884.	13 June "
8 Feb. "	

JAMES H. RIDINGS, *Recorder.*

THE SEMI-ANNUAL meetings of the American Entomological Society will be held at S. W. corner of 19th and Race Sts., Philadelphia, Pa., on the days following:—

10 Dec. 1883. 9 June 1884.

JAMES H. RIDINGS, *Recording Secretary.*

THE REGULAR monthly meetings of the Montreal Branch of the Entomological Society of Ontario, will be held at Montreal, Que., Canada, on the days following:—

2 Oct. 1883.	5 Feb. 1884.
6 Nov. "	4 Mar. "
4 Dec. "	1 Apr. "
8 Jan. 1884.	6 May "

G. J. BOWLES, *Secretary.*

THE MONTHLY meetings of the Brooklyn Entomological Society will be held in the rooms of Wright's Business College, Broadway, corner of Fourth Street, Brooklyn, E. D., the last Saturday of each month except July and August.

F. G. SCHAUPP, *Secretary.*

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MAY 1884.

CONTENTS:

ADVERTISEMENTS 166
ON THE LIFE-HISTORIES AND IMMATURE STAGES OF THREE EUMOLPINI. Corrective Note — *Stephen Alfred Forbes* 167-168
PROTECTIVE SECRETIONS OF SPECIES OF ELEODES — *Samuel Wendell Williston* . 168-169
A CURIOUS HABIT OF CALLOSAMIA PROMETHEA — *John George Jack* 169
PROCEEDINGS OF SOCIETIES — Cambridge Entomological Club 170
BIBLIOGRAPHICAL RECORD, no. 3455-3504 171-174
ENTOMOLOGICAL ITEMS — Society Meetings 175-176

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PSYCHE.

ON THE LIFE-HISTORIES AND IMMATURE STAGES OF THREE *EUMOLPINI*. CORRECTIVE NOTE.

BY STEPHEN ALFRED FORBES, NORMAL, ILLINOIS.

I regret to have to report a mistaken identification of the species of *Scelodonta* mentioned in my paper "On the life-histories and immature stages of three *eumolpini* (PSYCHE, Jan.-Feb. 1884, v, 4, p. 123-130, pl. 1).

When the imagos appeared in our breeding cages last June (see PSYCHE, v. 4, p. 129), I sent a pair of them to Dr. J. L. Leconte, with a request that he would take the trouble to determine them for me; and mentioned at the same time the economic relations of the species.

In his reply, dated June 24, 1883, from Alexandria Bay, N. Y., he says:

"I have examined carefully the specimens of *Graphops* [*Scelodonta*], which were safely received just after my arrival here. I find that they are without doubt *G. pubescens;* that species differs from allied ones *G. curtipennis* and *G. marcassita*, by the more elongate form and by the punctuation being rugose only at the sides."

With this decision I, of course, rested content, until this month, when the reception of specimens of *Scelodonta* collected from evening primrose (*Oenothera biennis*), in southern Illinois, in the vicinity of strawberry fields, led to a review of this determination. It was soon evident that these primrose specimens were of a different species from those breeding in strawberries, and had also a different life-history, since they were taken *in copula*, in April, at which time the strawberry species was abundant in the earth, in the larval condition, not to appear as adult until June.

As the primrose specimens agreed closely with all accessible descriptions of *S. pubescens*, I enclosed to Dr. G. H. Horn a specimen of this lot, together with one from the lot bred from strawberry root-worms last June, with a statement of Dr. Leconte's previous identification of the latter as *S. pubescens*.

In his reply, received this morning, Dr. Horn determines the primrose specimen as *S. pubescens*, and that from the

strawberry as *S. nebulosus*, saying further:

"The names I now give you are absolutely typical as far as Leconte's collection goes. Last summer his health was so poor and his eyesight so deceptive that I do not wonder that some of his comparisons were erroneous."

When we further notice that he was separated from his collection when he wrote me, it need not surprise us that for once Jove nodded.

So far as the paper in PSYCHE is concerned, the errors will be eliminated if *pubescens* is changed to *nebulosus* wherever it occurs, as a reëxamination of all the collections referred to shows that they consist of *nebulosus* only.

Illinois state laboratory of natural history,
17 April 1884.

PROTECTIVE SECRETIONS OF SPECIES OF ELEODES.

BY SAMUEL WENDELL WILLISTON, NEW HAVEN, CONN.

In connection with Dr. G: Dimmock's interesting article[1] on the glands opening externally in certain insects, it may be of interest to give some results of several years' observations of certain *tenebrionidae* on the Kansas plains. The following species, belonging to the genus *Eleodes*, viz., *E. acuta*, *E. suturalis*, *E. tricostata*, *E. obsoleta*, *E. extricata*, *E. longicollis*, and *E. hispilabris*, are abundant in the regions east of the Rocky Mountains, some of them very abundant, and with one or two exceptions, they all, when disturbed, eject a pungent, vile-smelling liquid. Perhaps the most disagreeable of these, in this respect, is *E. longicollis*, a beetle about two and a half centimetres long, which will eject a stream of fluid from the anal glands, sometimes to the distance of ten centimetres or more. This liquid has a strong, persistent odor, and leaves a brown stain upon the skin. Whether acid or alkaline in its reaction I cannot say, but its effect upon the skin is very much like the first solution of carbolic acid, though less strong. Several times I have had small quantities reach my eyes, with disagreeable effects. Both sexes are equally provided with the secretion, and, in individuals which have not been exhausted, it is directed backward with considerable force, as I once learned to my entire satisfaction. I had seized a fine, large pair of *E. longicollis* by the thorax and held them up, at what I deemed a safe distance, for them to eject their vile secretion before placing them in my collecting bottle. Unfortunately they were provided with an unusually large quantity, and, both ejecting it simultaneously, I received it on my face and hands. A very noteworthy habit, moreover, in the species of this genus at least, and a constant one is that, when approached, they stand almost vertically with the abdomen directed upwards ready the moment they are touched, to eject their mephitic secretion. Among the species given in the forego-

[1] Psyche, Sept.-Oct. 1882 [1 March 1884], v. 3, p. 387-401.

ing list, one (*E. tricostata*, if my memory serves aright) seems to be entirely devoid of this secretion, but yet has the same habit of standing erect. These beetles are the veritable skunks of their order, and doubtless, like their ill-scented superiors, find protection in their comparatively as formidable weapon. They are apterous, and slow in their movements, coming out from their hiding places when the sun is declining, and feed upon dead matter or excrements. On the bare plains they are readily seen, and I doubt not that they find protection from birds, and perhaps from skunks also, by means of their secretion.

[For further information on this subject, see Rec., 1430.]

A CURIOUS HABIT OF *CALLOSAMIA PROMETHEA*.

BY JOHN GEORGE JACK, CHATEAUGUAY BASIN, P. Q., CANADA.

For several years I have been very much puzzled, in summer, to account for numbers of green leaves, some being partly eaten, found on the ground beneath trees having long petioled leaves, such as maples and poplars, the petioles of which apparently had been eaten through by some insect. Last summer, while in New Jersey, I noticed similar occurrences beneath a sweet gum tree, *Liquidambar styraciflua*, and upon looking for the cause I found that it was the work of nearly full grown larvae of *Callosamia promethea*, which were feeding on the foliage. The petioles of *Liquidambar* leaves are usually very long (from 5 to 10 cm.) and quite slender.

To get at the leaves the caterpillar was either obliged to abandon the branch of the tree and crawl out on the leafstalk to the leaf, where it would be in a very dangerous position, with slight foothold, and where it was very probable that, owing to the weight of its body, it would break off the leaf at the node and fall to the ground; or, the caterpillar must contrive to bring the leaf to itself in some way, while still keeping a sure foothold on the branch. To do this last required a little skill and I found that the caterpillar was equal to the task. Grasping the twig firmly with the anal and sometimes one or two pairs of the abdominal legs, it would extend the remaining portion of its body along the leafstalk, which it commenced eating. As soon as the leafstalk was about half eaten through, the caterpillar would recede a little and eat another place half through or more, and sometimes a third place. By this time the leafstalk had become so weakened that the leaf began to droop, and the caterpillar, reaching forward again as far as possible and grasping the stalk beyond the first incision, was able to bend it, and, drawing the leaf up to itself, eat it without loosing its sure foothold on the tree.

Sometimes the leafstalk was eaten through a little too far, or broke off in bending, which accounted for the green leaves found on the ground.

PSYCHE.

CAMBRIDGE, MASS., MAY 1884.

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PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

(*Continued from p. 160.*)

Mr. G. Dimmock showed the two halves of a split wing of *Attacus cecropia*, in which the two layers of the wing had been separated by the following mode. The wing from a specimen that had never been dried is put first into seventy per cent. alcohol, then into absolute alcohol, and from the latter, after a few days' immersion, into turpentine. After remaining a day or two in turpentine, the specimen is plunged suddenly into hot water, when the conversion of the turpentine into vapor between the two layers of the wings so far separates these layers that they can be easily parted and mounted in the usual way as microscopical preparations on a slide. This is an easy way of demonstrating the sac-like nature of the wings of insects.

Dr. H. A. Hagen showed preparations to illustrate organs, of undetermined function, found on the larvæ of *gomphidae*, *libellulidae*, *aeschnidae*, but not as yet found on *agrionidae*, which he believes to be traces of segmental organs. The organs in question are little cavities or invaginations of the epidermis between the segments, one on each side of the median ventral line, on one, two, or three abdominal segments according to the family to which the larva belongs. Dr. Hagen gave a brief notice of these organs in the *Zoologischer anzeiger*, 5 April 1880, jahrg. 3, p. 161.

Mr. G. Dimmock showed a number of microscopical preparations to illustrate different points of insect anatomy.

11 JAN. 1884.—The 98th meeting, the tenth annual meeting, and the seventh since the incorporation of the Club, was held at the Secretary's house, 54 Sacramento St., Cambridge, 11 Jan. 1884. This meeting terminated the first decennial of the Club's existence, the first meeting having been held 9 Jan. 1874. In the absence of the President, Mr. C. C. Eaton was chosen Chairman. Six persons were present.

The Secretary announced the withdrawal from the Club of Mr. Edward Burgess, of Boston, Mass.

The following persons were elected to active membership: Charles C. Beale, of Faulkner, Mass.; Willard Loomis Devereaux, of Clyde, N. Y.; Thaddeus William Harris (grandson of the well-known entomological author who bore the same name), of Cambridge, Mass.; and John George Jack, of Chateauguay Basin, P. Q., Canada.

The following officers were elected for the ensuing year: President, Samuel Hubbard Scudder; Secretary, George Dimmock; Treasurer, Benjamin Pickman Mann; Librarian, Clifford Chase Eaton; members at large of the Executive Committee, Roland Hayward and Thaddeus William Harris. B. P. Mann was elected managing editor and G. Dimmock associate editor of PSYCHE for the ensuing year.

The annual reports of the Secretary, of the Treasurer, and of the Librarian were read and approved. [See further on.]

The address of the Retiring President, Mr. B. P. Mann, upon "The bibliography of entomology" was read by the Secretary. [This address is printed in full in PSYCHE, April 1884, v. 4, p. 155-159.]

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard: S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Brauer, Friedrich. On the metamorphoses of *blepharoceridae*. (Entom mo. mag., Jan. 1881, v. 17, p. 186.)

Note calling attention to author's "Eine unbewusste entdeckung Fritz Müller's" (Zool. anzeiger, 2a Mch. 1880, jahrg. 3, p. 134-135) [Rec., 1855]; both sexes of *blepharocera fasciata*, of Europe, have the eyes close to each other. *B: P. M.* (3455)

Buckler, W: Is the number of moults of lepidopterous larvae constant in the same species? (Entom. mo. mag., July 1880, v. 17, p. 42-43.)

Remarks on the variety of the number of molts undergone by larvae of different species of lepidoptera, with solicitation of observations to prove whether the number varies in the same species. *B: P. M.* (3456)

Cameron, P. On parthenogenesis in the *tenthredinidae*. (Entom. mo. mag., May 1881, v. 17, p. 271-272.)

Nematus pavidus and *taxonus glabratus* added to the list of parthenogenetic *tenthredinidae*, and complete parthenogenesis proved to occur in *poecilosoma pulveratum* and *eriocampa ovata*, all Scotch species. *B: P. M.* (3457)

Champion, G: C. Notes from Guatemala. (Entom. mo. mag., Feb. 1881, v. 17, p. 212-213.)

Mention of localities visited and of genera of insects encountered by the author in Guatemala. *B: P. M.* (3458)

Eaton, Alfred Edwin. An announcement of new genera of the *ephemeridae*. (Entom. mo. mag., 1881, v. 17: Jan., p. 191-192; Feb., p. 193-197.)

Describes as new genera of *ephemeridae: classoneuria, spaniophlebia, homoeoneuria, jolia, rhoenanthus, blasturus, atalophlebia, adenophlebia, choroterpes, thraulus, habrophlebia* and *callibaetis*, and restricts the genera *leptophlebia* and *baetis; asthenopus = campsurus;* mentions the type species of each genus and describes 5 new species, of which *homoeoneuria salviniae* is from Central America. *B: P. M.* (3459)

Fletcher, J. E. On parthenogenesis in *tenthredinidae*. (Entom. mo. mag., Jan. 1881, v. 17, p. 180.)

Statement of results of parthenogenetic reproduction observed in *phyllotoma vagans, eriocampa ovata, hemichroa rufa* and *nematus curtispina* and in two other species, not yet determined, of *tenthredinidae*. *B: P. M.* (3460)

Forbes, Stephen Alfred, *see* ILLINOIS STATE LABORATORY OF NATURAL HISTORY—*Director*, 1881-1882.

Goossens, Théodore. Des chenilles urticantes et quelques considérations sur l'utilité des œufs pour la classification. (Ann. soc. entom. France, 1881, s. 6, t. 1, p. 231-236.)

Abstr., entitled, "Jeukende rupsen." (Natura, March 1883, jahrg. 1, p. 83-85.)

Considers that the spines of *liparis* and *cnethocampa* are poisonous because of a powder produced by the drying of the secretion given out by the evaginable glands found upon the dorsum of these larvae; experiments made with this poisonous powder; discusses the position of *cnethocampa* among the lepidoptera; remarks on the use of the characters of their eggs in the classification of lepidoptera. *G: D.* (3461)

Hagen, Hermann August. Ueber ein eigenthümliches organ in der Begattungstasche zweier tineiden und dessen bedeutung für die befruchtung. (Zool. anzeiger, 9 Jan. 1882, jahrg 5, p. 18-21.)

Anatomy of the genitalia, and especially of the vesicula seminalis, in *prodoxus* and *pronuba*. *G: D.* (3462)

Horn, G: H: Synopsis of the *colydiidae* of the United States. (Proc. Amer. philos. soc., 19 April 1878, v. 17, p. 555-592.)

Includes the genera and species of *murmidiidae*. *S: H.*

Describes 15 new species belonging to the genera *cicones, ditoma, endophloeus, phloeonemus, coxelus, lasconotus, aulonium, oxylaemus, sosylus, pycnomerus, bothrideres* and *philothermus*. *H: W. T.* (3463)

Kane, W. F. de Vismes. Causes of abundance or otherwise of lepidoptera. (Entomologist, Nov. 1882, v. 15, p. 245-246.)

Effects of weather on the abundance of lepidoptera; observations made in England. *G: D.* (3464)

Kellicott, D: Simons. An example of protective mimicry. (N. A. entomologist, Oct. 1879, v. 1, p. 30-31.)

Notes the habit of the imago of *rhodophora florida* of lying concealed in the withering flowers of *oenothera biennis*, which it closely resembles in coloration. The larvae, which feed on the flowers and fruit of the same plant, are also protectively colored. *W: T.* (3465)

DE **Kerchove de Denterghem**, Oswald. L'ennemi de la pomme de terre. Notice sur le *doryphora decemlineata*. Bruxelles, 1875. t.-p. cover, 21 p., 1 col. pl. v. 25×16.5, t. 18.5 × 10.8. pam., 2 fr.

Statistical notes upon *doryphora decemlineata;* means taken by various European governments to prevent its introduction, and a discussion of the necessity of precautions; other notes; colored figures of different stages of *d. decemlineata*, and figure of imago of *d. juncta*. *G: D* (3466)

Kraepelin, K. Ueber die mundwerkzeuge der saugenden insecten. Vorläufige mittheilung. (Zool. anzeiger, 6 Nov. 1882, jahrg. 5, p. 574-579.)

Discusses anatomy of sucking mouth-parts of insects; describes and figures the mouth-parts of *bombus terrestris*, *notonecta glauca* and a species of *tabanus*. *G: D.* (3467)

Krancher, L., *ed.*, *see* DEUTSCHER BIENENFREUND . . . [Rec., 2816].

Krukenberg, C. Fr. W. Vergleichend-physiologische studien. 5e abth. Heidelberg, 1881 100 p., 3 pl.

Rev., by P. Mayer, (Zool. jahresber. für 1881, 1882, p. 3.)

Discussion of the chemical composition of and action of reagents on the blood and organs of insects. — *P. Mayer.* [Not seen.] *B: P. M.* (3468)

La Munyon, Ira W. New hymenoptera. (Proc. Nebraska assoc. advanc. sci, 8 March 1877.)

Separate. [North Platte, Nebr.] [2] p., t 14.2×8.5.

Describes *davisania* n. g., *d. aughei* n. sp., *trypoxylon sulcus* n. sp. [Separate only seen.] *B: P. M.* (3469)

La Munyon, Ira W. New orthoptera. (Proc. Nebraska assoc. advanc. sci., 8 Mar. 1877.)

Separate. [North Platte, Nebr.] [1] p., t 14.2×8.5.

Describes *pezotetix* [sic] *flavoannulatus* n. sp., *calopteuus sanguinocephalus* n. sp. [Separate only seen.] *B: P. M.* (3470)

Lankester, E. Ray. *Limulus* an arachnid. (Quart. journ. micros. sci., 1881, v. 21: July, p. 504-548; Oct., p. 609-649; pl. 28-29.)

Abstract, by P. Mayer. (Zool. jahresber. für 1881, 1882, p. 5-6.)

Gives a genealogical tree of arthropoda (copied by Mayer), and discusses the homologies of their segments, appendages, tracheae and sinews, defines the arachnida. [not seen.] — *P. Mayer.* *B: P. M.* (3471)

Lichtenstein, Jules. Another apterous male in the *coccidae*, *acanthococcus aceris*, Signoret. (Entom. mo. mag., April 1882, v. 18, p. 250-251.)

Brief account of the life history of *acanthococcus aceris*, of which the male is wingless. *G: D.* (3472)

Lintner, Joseph Albert. On *cecidomyia leguminicola*, n. sp. (Can. entom., July 1879, v. 11, p. 121-124.)

References to accounts of *cecidomyia* injuring leaves of *trifolium* in Europe; substitution of name *c. leguminicola* n. sp. for the preoccupied name *c. trifolii* given in author's "The clover-seed fly" . . . (*op. cit.*, Mch. 1879, p. 44-45) [Rec., 3474]; seasons, history and geographical distribution of *c. leguminicola;* description of imago. *B: P. M.* (3473)

Lintner, Joseph Albert. The clover-seed fly: a new insect pest. (Can. entom., Mch. 1879, v. 11, p. 44-45.)

Review, in author's "On *cecidomyia leguminicola*, n. sp." (*op. cit.*, July 1879, p. 121-124).

Habits and ravages and description of larva of *cecidomyia trifolii* n. sp. [The name *c. leguminicola* afterward substituted (p. 121), as the name *c. trifolii* was preoccupied.] *B: P. M.* (3474)

Llewelyn, J. T. D. Results of experiments in rearing *tephrosia crepuscularia* and *biundularia*, with regard to variation. (Entom. mo. mag., May 1882, v. 18, p. 274.)

Results of interbreeding varieties of *tephrosia crepuscularia* and *t. biundularia* in order to obtain specimens of varieties. *G: D.* (3475)

Ludwig, Fritz. Ueber die bestäubungsvorrichtung und die fliegenfalle des hundskohles, *apocynum androsaemifolium* L. (Kosmos, Dec. 1880, bd. 8, p. 182-185.)

Abstract, by H. Müller, under same title. (Bot. zeitung, 1 Apr. 1881, bd. 39, c. 213-214.)

Abstract, by H. Müller, entitled "Die bestäubungseinrichtung von *apocynum androsaemifolium* L." (Bot. jahresbericht . . . Just, 1879, v. 7, p. 140, 8 cm.)

Describes the structure of the flowers of *apocynum androsaemifolium*, and their cross-fertilization by *apis* and large *syrphidae*. Small *syrphidae* and *muscidae* are unable to remove the pollen masses, and are held prisoners in the flowers. *W: T.* (3476)

McCook, H: Christopher. On the architecture and habits of the cutting ant of Texas, *atta fervens*. (Annals and mag. nat. hist., June 1879. s. 5, v. 3, p. 442.)

"The cutter [*atta fervens*] grasps the leaf with outspread feet and makes an incision at the edge by a scissor-like motion of her sickle-shaped toothed mandibles. She gradually revolves, steadily cutting as she does so, her mandibles thus describing a circle or the greater portion thereof." *R. H.* (3477)

McDonald, G. L. Peculiar mistake of *dytiscus marginalis*. (Entomologist, Nov. 1883, v. 16, p. 263-264.)

Dytiscus marginalis probably mistakes the glassy surface of a greenhouse for water. *G: D.* (3478)

McLachlan, Robert. Discovery of the winged form of *prosopistoma punctifrons*. (Entom. mo, mag., July 1880, v. 17, p. 46.)

Prosopistoma punctifrons bred to the sub-imago state by A. Vayssière, and proved to be one of the *ephemeridae*. *B: P. M.* (3479)

McLachlan, Robert. A monographic revision and synopsis of the trichoptera of the European fauna. Lond., *J: Van Voorst*, 1874-1880. [*9 parts, each with t.-p. cover.*] t.-p., 4+523+[Suppl., appendix and indices] 103 p., 59 pl.+t.-p., 26×16, t 20×11.5 £3, 8s.

Rev. (Bertkau's Bericht . . . der entomologie, 1873-1874, p. 180-181; 1875-1876, p. 278-280; 1877-1878, p. 382-385; 1879, p. 158-163.)

Rev., by H. A. Hagen. (Zool. jahresbericht, 1879, p. 580-581; 1880, abtheil. 2, p. 228-230.)

Rev., by M. Rostock. (Entom. nachrichten, 15 Oct. 1880, jahrg. 6; Lit. rev., p. 72.)

General structure of trichoptera; generic and specific characters, and notes on mode of preservation in collections; descriptions, classification, synonymy, habits and habitats of the European species; supplement, containing additional notes made while the work was in progress; appendix consisting of a systematic catalog of the trichoptera of Europe and a discussion of their geographical distribution; index of genera and of species. *G: D.* (3480)

McLachlan, Robert. A North American species of *dilar*. (Entom. mo. mag., Aug. 1881, v. 18, p. 55.)

Describes *dilar americanus*, a new species from Kentucky *G: D.* (3481)

McLachlan, Robert. *Prosopistoma punctifrons*. (Entom. mo. mag., Oct. 1880, v. 17, p. 117.)

Denial of "the former possession of an opinion that the insects [*prosopistoma punctifrons*] might be an ephemerid suited for a continuous aquatic life." *B: P. M.* (3482)

McLachlan, Robert. On two new *panorpidae* from western North America. (Entom. mo. mag., July 1881, v. 18, p. 36-38. 2 fig.)

Describes *bittacus chlorostigma* (from Cal.) and *panorpodes oregonensis* (from Oreg.), 2 new species, and figures their abdominal appendages. *G: D.* (3483)

M'Rae, W. Prolonged existence of ichneumon in pupa. (Entomologist, Aug. 1883, v. 16, p. 188-189.)

An ichneumonid remained in the pupal state two years beyond the normal time. *G: D.* (3484)

M'Rae, W. Retarded development of *saturnia carpini*. (Entomologist, June 1882, v. 15, p. 131-132.)

A female of *saturnia carpini* emerged in April 1882, from a cocoon made in 1879; this female seemed to be entirely unattractive to males of the same species. *G: D.* (3485)

M'Rae, W. Retarded emergence of *sphinx ligustri*. (Entomologist, Aug. 1883, v. 16, p. 187.)

A specimen of *sphinx ligustri* remained in the pupal state, in a fern-case kept indoors, from Sept. 1881 to April 1883. *G: D.* (3486)

Mann, B: Pickman. Bibliography of some of the literature concerning destructive locusts. (2d rept. U. S. entom. commission, for 1878 and 1879, 1880: Appendix 4, p. 33-50.)

Separate, author's ed., including [C. Thomas'] "Supplementary list" (*op. cit.*, p. 50-55) and [C. Thomas'] "Additions to bibliography on the locusts of America" (*op. cit.*, p. 55-56), with above title. [Wash.], 1880 [18 Mch. 1881]. ½-t.-p. cover + ½-t.-p. + p. 33-56, 24 × 16. [Rec., 3291 *s.*]

List of writings on destructive *acridiodea* of Europe, Asia and Africa, with partial analyses of contents. *B: P. M.* (3487)

Martini, W. Spannnadeln. (Entom. nachrichten, 1 May 1881, jahrg. 7, p. 144.)

Description of a form of needle suitable for use in spreading lepidoptera. *G: D.* (3488)

Meinert, Fr. Fluernes munddele. Trophi dipterorum. Paa Carlsberg-fondets bekostning. Kjöbenhavn, *H. Hagerup*, 1881. t.-p. cover, t.-p., 91 p., 6 pl., 27 × 21, t 19 × 14.2.

Historical and general remarks on the trophi of diptera; more detailed description, with figures, of those parts in *culex, simulium, miastor, oligarces, tipula, limnobia, dilophus, tabanidae, subula, thereva, leptis, empis, asilus, myopa, stratiomys, dolichopus, scaeva, rhingia, eristalis, stomoxys, musca, mesembrina, ephydra, gastrus, melophagus*, and *nycteribia*. The summary of general conclusions and explanation of the plates are in latin. *G: D.* (3489)

Melchert, G. Einige vorschläge zur präparation. (Entom. nachrichten, 1 June 1880, jahrg. 6, p. 116-117.)

Discusses pinning insects and packing them for transportation. *G: D.* (3490)

Melvill, J. Cosmo. Cannibalism in *pieris crataegi*. (Entomologist, Jan. 1883, v. 16, p. 15-16.)

A number of individuals of *pieris crataegi* seen sucking out the juices of a fallen comrade. *G: D.* (3491)

Membeers, O. W. U. [*psend.*]. Insects on the Halifax. (Florida agriculturist, 13 July 1881, v. 4, p. 65, col. 3-4, 16 cm.)

Statement concerning the domestic insect fauna at Ormond, Fla. *B: P. M.* (3492)

[**Metallic** casts of beetles.] (Amer. nat., Nov. [28 Oct.] 1881, v. 15, p. 933-934.)

Description of process for taking metallic casts of insects. *G: D.* (3493)

Möschler, Heinrich B. Beiträge zur schmetterlingsfauna von Surinam. [1.] (Verhandl. k.-k. zool.-bot. gesells. zu Wien, 1876, bd. 26; Abh., p. 293-352, pl. 3-4.)

Notes on lepidoptera from Surinam, South America, some of the species being also found in North America. Describes new species but no new genera. *G: D.* (3494)

Möschler, Heinrich B. Beiträge zur schmetterlings-fauna von Surinam. II. (Verhandl. k.-k. zool.-bot. gesells. zu Wien, 1877, bd. 27; Abh., p. 629-700, pl. 8-10.)

Notes on lepidoptera from Surinam, South America, some of the species being also found in North America. Describes the following new genera: *campylona, endoliche, culimacodes, eulophopteryx, euxoga, lepasta, phedosia, pseudapistosia, pseudeuceron, pseudodryas, senia, sychesia* and *tricypha*. *G: D.* (3495)

Möschler, Heinrich B. Beiträge zur schmetterlings-fauna von Surinam. III. (Verhandl. k.-k. zool.-bot. gesells. zu Wien, 1880, bd. 30; Abh., p. 379-486, pl. 8-9.)

Notes on lepidoptera from Surinam, South America, some of the species being also found in North America. Describes the following new genera: *adyroma, amabela, amphodia, arbinia, arctinia, bavilia, buphana, cladenia, clapra, daedalina, erioscele, gabyna, gonuris, mindora, placonia, smyra, synalissa* and *thelidora*. *G: D.* (3496)

Möschler, Heinrich B. Beiträge zur schmetterlings-fauna von Surinam. IV. (Verhandl. k.-k. zool.-bot. gesells. zu Wien, 1881, bd. 31; Abh., p. 393-442, pl. 17-18.)

Notes on lepidoptera from Surinam, South America, some of the species being also found in North America. Describes the following new genera: *blechroma, diastema, ligonia, linosta, liopasia, neophrida, pilemia, singumia* and *tanyodes*. *G: D.* (3497)

Möschler, Heinrich B. Beiträge zur schmetterlings-fauna von Surinam. V. Supplement. (Verhandl. k.-k. zool.-bot. gesells. zu Wien, 1882, bd. 32; Abh., p. 303-362, pl. 17-18.)

Notes on lepidoptera from Surinam, South America, some of the species being also found in North America. Describes the following new genera: *alimera, antiora, asylaea, charmodia, gonippa, lysana, phiditia, pryteria, strophocerus, talmenia, thagona* and *ulamia*. *G: D.* (3498)

Murtfeldt, Mary Esther. Rose-feeding *tortricidae*. The rose leaf-tyer, *penthina cyanana*, n. sp. (Amer. entom., Jan. 1880, v. 3, n. s., v. 1, p. 14-15.)

List of ♀ *tortricidae* injurious to *rosa;* description of larva, pupa and imago and habits of and means against *penthina cyanana* n. sp. *B: P. M.* (3499)

Nusbaum, Joseph. Zur entwickelungsgeschichte der ausführungsgänge der sexualdrüsen bei den insecten. (Zool. anzeiger, 27 Nov. 1882, jahrg. 5, p. 637-643.)

On the development of the excretory ducts of the sexual glands of insects, based especially on a study of *lipeurus bacilus, goniocotes hologaster* and *blatta orientalis*. *G: D.* (3500)

[**Riley,** C: Valentine.] Galls and gall-insects. (Amer. nat., May [16 Apr.] 1881, v, 15, p. 402-403.) (RILEY, C: V. Entomology . . . [May 1882], p. 402-403.)

Notice of H. F. Bassett's "New species of *cynipidae*" (Can. entom., Mch. 1881, v. 13, p. 51-57) [Rec., 3357]: *cynips q.-californica* occurs on *quercus douglasii;* its gall nourishes the coleopteron *orognathus cornutus;* habits of the latter; synonymy of both species. *B: P. M.* (3501)

Saunders, E: Notes on the hairs of hymenoptera. (Entom. mo. mag., Feb. 1881, v. 17, p. 201-202. fig. 1-3.)

Descriptions and figures of hairs from the eyes of *coelioxys* and the tibiae of *andrena* and *bombus; hymenoptera mellifera* seem to differ from other hymenoptera in having branched or plumose hairs; approximation of hairs to scales. *B: P. M.* (3502)

Wilkinson, Clennell. *Vanessa cardui* double brooded. (Entom. mo. mag., July 1880, v. 17, p. 43-44.)

Record of occurrence of a second brood of *vanessa cardui* in November, in South Wales, the first brood having occurred in August; remark, by C: G. Barrett, on this phenomenon as "an instinctive attempt at following up the habit of the species in a hotter climate." *B: P. M.* (3503)

Witlaczil, Emanuel. Zur Anatomie der Aphiden. Vorläufige Mittheilung. (Zool. Anzeiger, 15 May 1882, jahrg. 5, p. 239-241.)

Outline of the general anatomy of *aphidae*. *G: D.* (3504)

ENTOMOLOGICAL ITEMS.

MONSIEUR A. DÉLUGIN, pharmacien, à Blois, France, wishes to exchange the French species of *Donacia* for those of North America.

MR. HOWARD L. CLARK publishes, in *Random notes on natural history*, for May 1884, an account of a swarm of *Callidryas eubule* seen in Rhode Island, in 1869 or 1870.

JUST AS this numero goes to press we learn of the sudden death of Francis Gregory Sanborn, of Worcester, Mass., well-known as an entomologist. He died 5 June 1884, at Providence, R. I.

MR. ANSON ALLEN, lepidopterist, died in Orono, Me., 8 Feb. 1884, in the 55th year of his age. Prof. C. H. Fernald publishes an obituary notice of Mr. Allen in the *Canadian entomologist* for March, 1884, v. 16, p. 43-44.

MR. S. SCHOFIELD, at a late session of the Rhode Island entomological society, read a paper on experiments made with the eggs and larvae of *Ceratocampa imperialis*. The mode of fighting among these larvae was graphically described.

M. EDMOND ANDRÉ, à Beaune, Côte-d'Or, France, who has lately established an agency for the sale of entomological publications and apparatus, has just issued his fourth catalog of books for sale, including a large number of French separates.

Dr. JACOBS notes two recent cases in which the larvae of *Dermatobia noxialis*, a dipteron have been found beneath the skin of persons who have returned to France from America. These cases have been announced in the Annals of the Société de biologie de France, and in the Comptes rendus of the Société entomologique de Belgique.

WE REGRET to learn that Sir Sidney Smith Saunders, C. M. G., for many years British consul in various Mediterranean ports, and a distinguished entomologist, died suddenly on Tuesday evening (15th) at an advanced age. He was one, of the original members of the Entomological society of London, and was a vice-president of the society at the time of his death. He devoted special attention to the singular bee-parasites known as *stylopidae*.—*Nature*, 17 Apr. 1884, v. 29, p. 581.

THE NEWLY organized Entomological society of Washington has elected the following officers: President, C. V. Riley; vice-presidents, J. G. Morris and Geo. Marx; recording secretary, E. A. Schwarz; corresponding secretary, L. O. Howard; treasurer, B. P. Mann; executive committee, the officers and W. S. Barnard, P. R. Uhler and A. J. Shafhirt. Meetings are held the first Thursday of each month.

M. ADRIEN DOLLFUS, the enterprising editor of the *Feuille des jeunes naturalistes*, offers to the subscribers of his paper a prize for competitive work in dissection and insect anatomy. A sample of the kind of work required is given in the *Feuille* for May, in a paper, by Dr. H. Viallanes, entitled "Anatomie et dissection de la larve de libellule," with a plate. The subject proposed by M. Dollfus is the anatomy of the larva of some diurnal lepidopteron, and the paper is to be accompanied by drawings of the parts. The first prize is a scientific work, of the value of 50 francs, to be chosen by the successful competitor; a second prize of 25 francs value may be given. We wish the best of success to M. Dollfus, who works with patriotic zeal to instil a love of scientific study of nature into the readers of his interesting paper.

G: D.

DR. J. A. OSBORNE writes, in the *Entomologist's monthly magazine* for Dec. 1883, among some observations on *Zaraea fasciata*.

"Last year I was not able to say positively in which end of the egg the head of the embryo develops. As the result of numerous observations I am now in a position to state, that the head of the embryo is found in the

upper and lower pole of the egg with about equal frequency. Often we meet with two eggs lying together, evidently laid by the same fly with the same orientation, in which the heads of the embryos lie in opposite directions. This is in direct contradiction to the dictum of Leuckart: 'Der obere Pol des Eies beherbergt in allen Fällen das Kopfende des Thieres' (Ueber die Micropile, &c., *Müller's archiv*, 1855, p. 102). Rare exceptions to the rule occur also, as I have already shown, in the eggs of *Gastrophysa raphani*." The abnormal position of the dorsum and venter of the embryo in these eggs is then discussed.

A NEW species of trap-door spider, a species of *Cteniza*, has been discovered at San José, Cal. The common though little known species of southern California is known as *C. californica*; and its trap-door nest is usually placed in museums beside the tarantula (*Mygale hentzii*), and erroneously labelled as the tarantula's nest. This popular error, by which dealers in curiosities generally profit, is stranger, since the tarantula is usually too large to enter the nest of *Cteniza*, and itself makes no nest, occupying crevices in the ground or under stones, spinning a small web.—*Science*, 11 April 1884, v. 3, p. 469.

SOCIETY MEETINGS.

THE REGULAR meetings of the Cambridge Entomological Club will be held at 7.45 p. m., on the days following:—

12 Oct. 1883.	14 Mar. 1884.
9 Nov. "	11 Apr. "
14 Dec. "	9 May "
11 Jan. 1884.	13 June "
8 Feb. "	

G. DIMMOCK, *Secretary*.

THE NEW YORK Entomological Club meets twice monthly, except in June, July and August, but no special date is fixed for each meeting.

HENRY EDWARDS, *Secretary*.

THE REGULAR meetings of the Entomological Section of the Boston Society of Natural History will be held at N. W. corner of Berkeley and Boylston Sts., Boston, Mass. at 7.45 p. m., on the days following:—

24 Oct. 1883.	27 Feb. 1884.
28 Nov. "	26 Mar. "
26 Dec. "	23 Apr. "
23 Jan. 1884.	28 May "

EDWARD BURGESS, *Secretary*.

THE REGULAR meetings of the Entomological Section of the Academy of Natural Sciences, of Philadelphia, Pa., will be held at S. W. corner of 19th and Race Sts., on the days following:—

12 Oct. 1883.	14 Mar. 1884.
9 Nov. "	11 Apr. "
14 Dec. "	9 May "
11 Jan. 1884.	13 June "
8 Feb. "	

JAMES H. RIDINGS, *Recorder*.

THE SEMI-ANNUAL meetings of the American Entomological Society will be held at S. W. corner of 19th and Race Sts., Philadelphia, Pa., on the days following:—

10 Dec. 1883.	9 June 1884.

JAMES H. RIDINGS, *Recording Secretary*.

THE REGULAR monthly meetings of the Montreal Branch of the Entomological Society of Ontario, will be held at Montreal, Que., Canada, on the days following:—

2 Oct. 1883.	5 Feb. 1884.
6 Nov. "	4 Mar. "
4 Dec. "	1 Apr. "
8 Jan. 1884.	6 May "

G. J. ROWLES, *Secretary*.

THE MONTHLY meetings of the Brooklyn Entomological Society will be held in the rooms of Wright's Business College, Broadway, corner of Fourth Street, Brooklyn, E. D., the last Saturday of each month except July and August.

F. G. SCHAUPP, *Secretary*.

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Vol. 4. Nos. 122-123.

JUNE-JULY 1884.

CONTENTS:

ADVERTISEMENTS 178
ON THE NERVOUS SYSTEM OF THE HEAD OF THE LARVA OF CORYDALUS CORNUTUS LINN.—*William Christopher Krauss* 179–184
SEXUAL CHARACTERS IN THE CHRYSALIDS OF GRAPTA INTERROGATIONIS—*Mary Esther Murtfeldt* 184
REVIEW 185
PROCEEDINGS OF SOCIETIES—Cambridge Entomological Club 186
BIBLIOGRAPHICAL RECORD, no. 3505-3550 187–190
ENTOMOLOGICAL ITEMS—Society Meetings 191–192

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PSYCHE.

ON THE NERVOUS SYSTEM OF THE HEAD OF THE LARVA OF *CORYDALUS CORNUTUS* LINN.

BY WILLIAM CHRISTOPHER KRAUSS, ATTICA, N.Y.

[With Plate 2.]

[Extract from a thesis in entomology, presented to the Faculty of the Cornell university for the Baccalaureate in science.]

The nervous system of the head of the larva of *Corydalus cornutus* Linn., consists of—

1. The supra-oesophageal ganglia or cerebrum, and nerves.
2. The crura cerebri.
3. The sub-oesophageal ganglion or cerebellum, and nerves.
4. The commissures.
5. The vagus nerve.

1. THE SUPRA-OESOPHAGEAL GANGLIA, OR CEREBRUM. — The supra-oesophageal ganglia (fig. 1. 1) are situated in the dorso-cephalad part of the head, midway between the tips of the labrum and the base of the head. They lie dorsad of the oesophagus, and immediately entad of the dorsal body wall, being separated from it only by thin, delicate layers of adipose tissue.

The supra-oesophageal ganglia, the probable homologs of the vertebrate cerebrum, differ greatly from the other ganglia or nerve centres of the body. They are a compound organ composed of two distinct ganglia or hemispheres connected together by a short, thick commissure on the meson, but are sometimes described as a single ganglion. These hemispheres are similar in outline, having an ovoid appearance. The lateral ends of the hemispheres taper into the cerebral nerves. In the two-year-old larva, the cephalo-caudal diameter of the hemispheres is three-fourths of a millimetre, and the two together attain the length of two millimetres.

The ventro-latero-cephalad borders of the cerebrum are developed ventrad, forming the crura cerebri, which connect it with the sub-oesophageal ganglion.

The cephalad extremity of the aorta is attached to the neurilemma, at the cau-

dad border of the supra-oesophageal ganglia on the meson. The opening of the aorta appears as is shown in the plate, fig. I. 7, the dorsal wall having a forked opening near the attachment of the aorta to the neurilemma.

The supra-oesophageal ganglia are supplied by two large tracheae lying parallel to the oesophagus (fig. IV, 4). Each trachea sends three branches to the ventral side of each hemisphere. These branches divide and sub-divide, ramifying to all parts of the hemispheres (fig. IV). The supra-oesophageal ganglia are covered with a thin, delicate curtain-membrane, the neurilemma.

The cerebral nerves. — The cerebral nerves consist of two trunks of nerves, which originate from two tracts at the lateral apices of the supra-oesophageal ganglia. The cephalad tract gives rise to the antennal nerve, and also a small integumentary nerve, and may therefore be called the antennal tract. The caudad tract gives rise to the optic nerves, and may therefore be called the optic tract.

The antennal nerve. — The antennal nerve (fig. I. 4) arises from the antennal tract. It extends laterad a distance of one and one-half millimetres, and divides into a cephalad and a caudad branch.

The cephalad branch (fig. I. 4. *a*) continues its course laterad, then cephalad, and enters the antenna, supplying it with nerves. It is therefore, probably, the tactile or sensor nerve of the antenna.

The caudad branch (fig. I. 4. *b*) continues laterad, and enters the muscles of the antenna in the head (fig. I. 9). At the point of entering the muscles it divides into several small branches. This nerve is probably the motor nerve of the antenna. Another small nerve (fig. I. 4. *c*) arises from the antennal tract, and extends laterad a distance of two millimetres; it then divides into two branches. These branches pass dorsad of the antennal muscles, and enter the integument near the retinas of the eyes.

The optic nerves. — The optic trunk of nerves (fig. I. 5) arises from the optic tract. This trunk extends laterad a short distance and divides into seven distinct branches, the optic nerves. These branches continue their course laterad, and are distributed one to each of the seven retinas. It is an interesting fact, that although there are seven retinas, the external parts of only six ocelli are developed. The presence of the seventh retina and optic nerve cannot be doubted, as it was observed in many specimens of the one- and two-year-old larvae. Fig. VI shows the separation of the optic trunk into the seven optic nerves. The optic and antennal nerves are protected by a covering, the extension of the neurilemma or theca (fig. VI. 3) which covers the sub- and supra-oesophageal ganglia and nerves.

2. *The crura cerebri.* — The crura cerebri or the cerebro-cerebellar commissures (fig. IV. 3 and fig. VII. 2) are two cords of nerve matter connecting the sub- and supra-oesophageal ganglia, and with them encircle the oesophagus.

They arise from the ventro-latero-cephalad portions of the supra-oesophageal ganglia, and extend ventrad, joining the sub-oesophageal ganglion at its dorso-latero-cephalad borders. They are similar in outline and appearance to the commissures of the body. They present a convexity laterad and a concavity mesad, corresponding to the cylindrical outline of the oesophagus.

The crural nerves. — At the points of departure of the crura cerebri from the supra-oesophageal ganglia, each crus gives off two nerves, the vagus and the clypeo-labral (fig. I. 2, 3 and fig. IV. 8, 9). The vagus nerve will be described later as a special part of the nervous system of the head.

The clypeo-labral nerves.—The clypeo-labral nerves, two in number, arise one from each crus near its origin (fig. I. 3). They extend cephalad and a little mesad. Each gives off three small branches in the clypeus, and a fourth, long branch which extends cephalad to the base of the labrum and penetrates the integument. After giving off these branches, the main trunk extends cephalad into the labrum and may be termed the labral nerve. This labral nerve divides into several small branches near the tip of the labrum. The largest of these branches enters a labral palpus (?), or probably a seta.

The crura cerebri are joined together by a cord of nerve matter (fig. VII. 3) one-half millimetre from their attachments to the sub-oesophageal ganglion. This cord or cross-nerve of the commissures is dorsad of the cephalad part of the sub-oesophageal ganglion, and is entirely concealed by it. The cross-nerve arises from the commissures and like the commissures follows the outline of the oesophagus, presenting a convexity ventrad, and a concavity dorsad.

3. THE SUB-OESOPHAGEAL GANGLION, OR CEREBELLUM.—The sub-oesophageal ganglion (fig. II. 1) is situated in the ventro-cephalad part of the head, midway between the tips of the labium and the base of the head. It lies ventrad of the oesophagus, and is separated from the ventral body-wall by a layer of muscles and by adipose tissue. The sub-oesophageal ganglion, the probable homolog of the vertebrate cerebellum, differs somewhat from the other ganglia. It is nearly cordate in outline, with two apices pointing caudad and terminating in the commissures. Its cephalo-caudal diameter is one and one-half millimetres, and its greatest width is one millimetre, in the two-year-old larva. It is connected to the supra-oesophageal ganglia by the crura cerebri, and to the other ganglia of the body by the commissures. It is covered with a thin, delicate curtain-membrane, the neurilemma.

Tracheae also penetrate the body of the ganglion, ramifying to all parts.

The cerebellar nerves.—The cerebellar nerves consist of a pair each of labial, gustatory, maxillary, and mandibular nerves, and three other, unnamed pairs of nerves.

The labial nerves. — The labial nerves (fig. II. 3) originate from the ventro-latero-cephalad borders of the sub-

oesophageal ganglion, and continue their course cephalad into the labium. At a point one millimetre from the ganglion two branches are given off laterad, one from each nerve, which divide into several small branches piercing the integument.

At a point two millimetres from the ganglion two branches are given off, one from each nerve, going cephalo-laterad to the integument.

At a point three millimetres from the ganglion the labial nerve separates into two large branches, one extending to the palpus, and one to the distal end of the ligula. The nerve of the labial palpus enters that organ, and near its extremity separates into several small branches. The ligular nerve continues cephalad into the ligula, and near its extremity divides into two or three small branches. The nerve of the labial palpus gives off a very small nerve at the point of entering the palpus.

The gustatory nerves. — The gustatory nerves (fig. II. 2), if they may be so called, arise from the cephalad border of the sub-oesophageal ganglion, and continue their course cephalad into the ligula, being in close relation to the floor of the mouth. At a point three millimetres from the ganglion, at the caudad part of the ligula, the nerves meet on the meson, forming an arch. The dextral nerve sends a small nerve laterad about one and one-half millimetres from the ganglion, while the sinistral nerve sends a branch laterad one millimetre from the ganglion. The two nerves, at the point of changing their course from cephalad to mesad, give off two branches, one from each nerve. These branches continue cephalo-laterad, piercing the floor of the mouth. These branches also divide into several smaller branches. The arch of the gustatory nerves gives off two small nerves, going cephalad, which unite at a point one millimetre from the arch. This united nerve divides into three small nerves, one going cephalad, and two going cephalo-laterad. The gustatory nerves and branches are very fine and delicate, and are closely related to the integument which forms the walls of the labium and ligula.

The maxillary nerves. — The maxillary nerves (fig. II. 5 and fig. III) arise from the ventro-latero-cephalad borders of the sub-oesophageal ganglion as a single trunk, which immediately divides into four branches. These may be indicated by the letters a, b, c, d, fig. II. 5, and A, B, C, fig. III.

Nerve A (fig. III), which is the largest of the branches, forks at a point about two millimetres from the ganglion. Both branches enter the maxilla, going to its extremity, and one of them enters the maxillary palpus.

Nerve B. — This branch divides into two branches, three millimetres from the ganglion, one branch forking immediately and going cephalad. The other branch continues laterad, dividing into several branches which pierce the integument.

Nerve C.—This branch forks two millimetres from the ganglion, one branch going cephalad to the maxilla, the other

branch going caudad, giving branches to the maxillary muscles in the head. The cephalad branch divides into two branches four and one-half millimetres from the ganglion, both continuing their course cephalad.

The fourth nerve (fig. II. 5. *d*) is a very small nerve which divides into two branches entering the maxillary muscles.

The mandibular nerve. — The mandibular nerve (fig. II. 4 and fig. V) arises from the dorso-latero-cephalad borders of the sub-oesophageal ganglion, and continues laterad to the mandibles. Before entering the mandibles three branches are given off (fig. V. 2, 3, 4).

The first branch (fig. V. 2) gives off two nerves which go caudad, entering the mandibular muscles.

The second branch (fig. V. 3) goes laterad a short distance, then forks. The caudad fork, dividing into two branches, enters the mandibular muscles. The cephalad branch is united to a long nerve going cephalad. This nerve forks one and one-half millimetres from the base of the mandibles. This nerve extends caudad of its attachment to nerve 3 (fig. V), and enters a muscle. Just caudad of its attachment to nerve 3 it gives off a very fine and delicate nerve which goes cephalad into the mandibles. Nerve 4 (fig. V) goes laterad two millimetres, then forks, one branch going caudad to supply the mandibular muscles in the head, the other branch going cephalad into the mandibles. The mandibular nerve gives off a branch at the point of entering the mandibles, two branches one and one-fourth millimetres from the base of the mandibles, and then forks at a point two and one-fourth millimetres from the base into two branches, which continue their course cephalad. The more minute branches of the mandibular nerve are shown in fig. V.

Other nerves. — A small nerve (fig. II. 6) arises immediately caudad of the attachment of the labial nerve on the ganglion, and divides into several branches going to the adjacent muscles.

From the lateral borders of the sub-oesophageal ganglion two nerves are given off, one on each side, going caudad parallel to the commissures (fig. II. 8). These nerves enter the perivisceral cavity.

At the caudad part of the ligula, three millimetres from the sub-oesophageal ganglion on the meson, are attached two long nerves going caudad (fig. II. 7). These nerves are joined to the labial nerves by neurilemma and by two very fine nerves, one on each side. At the ganglion each nerve gives off two small, delicate nerves which are joined to nerve 6 (fig. II). The main branch continues caudad, but no caudal attachment was found. The cephalad attachment of these nerves is not shown in fig. II, having been dissected away to show the cephalad extremity of the gustatory nerves.

4. THE COMMISSURES. — The caudad end of the sub-oesophageal ganglion terminates in two large white cords, the commissures (fig. II. 9, fig. VII. 4). These commissures are similar to the commissures of the body, and join the sub-oesophageal ganglion to the first

thoracic. Each commissure gives off a nerve three and one-half millimetres from the ganglion, going caudad. The distance of these nerves from the ganglion varies however (fig. II. o).

5. THE VAGUS NERVE. — The vagus nerve of *Corydalus cornutus* arises as two nerves from the crura cerebri, dorsad of the labial nerves (fig. IV. 9). These nerves pass cephalo-mesad, forming two arches, and unite in a ganglion on the median line dorsad of the palate. This ganglion (fig. I. 2, fig. IV. 2) is sometimes called the frontal ganglion, and is immediately cephalad of the supra-oesophageal ganglion. The vagus nerve departs from the caudad part of the ganglion, passes caudad between the aorta and the oesophagus, and continues on the median line until it reaches a point two millimetres caudad of the frontal ganglion (fig. IV. 9). Here it enters another ganglion smaller than the frontal ganglion. This ganglion is also situated on the median line between the aorta and the oesophagus. Two nerves depart from this ganglion, going latero-caudad to the sides of the oesophagus (fig. I. 8, fig. IV. o). They continue their course caudad until they reach the pro-ventriculus, where they divide into many branches.

The vagus nerve gives branches to the aorta in the head, and numerous nerves are continually given off to the oesophagus.

SEXUAL CHARACTERS IN THE CHRYSALIDS OF *GRAPTA INTERROGATIONIS*.

BY MARY ESTHER MURTFELDT, KIRKWOOD, MO.

The publication in PSYCHE for November-December 1883, v. 4, p. 103-106, of the full text of Mr. Lintner's interesting paper on "A new sexual character in the pupae of some lepidoptera," reminds me of an observation which I made last summer on the chrysalids of *Grapta interrogationis*.

Desirous of obtaining fresh specimens of this species, I placed about a dozen elm-feeding larvae in a rearing cage, from which, in due time, I obtained eleven chrysalids. These were, in respect to color and ornamentation, of two distinct sorts. The larger proportion were of a dull, pale fuscous with darker brown lateral stripes, dots and markings, without a trace of metallic ornamentation, while four were much paler in general color, inclining to golden brown, each ornamented with the eight brilliant, pale-golden, papillose dorsal spots by which this chrysalis is usually characterized. From each of the pale and gilded chrysalids emerged a female, while the seven dark and unornamented ones gave forth males exclusively. This observation may be a mere corroboration of a well known fact concerning the sexual characters of the species, but if so I have not met with it, or it has entirely escaped my memory.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

(*Continued from p. 170.*)

Dr. G: Dimmock showed abnormally colored specimens of *Thyreus abbotii*, and made some remarks upon the causes which produced their abnormal coloration.

The annual report of the Secretary for the year 1883 reports the number of active members, 1 Jan. 1884, as 32, the number of associate members, 50. Four associate members, Messrs. Belfrage, Chambers, Glover, and LeConte, who were included in the list of members published last year, are dead. During the year 1883 the Club held 9 meetings; the average attendance was 5.2.

The annual report of the Treasurer states the deficit on volume 1 of PSYCHE, for which Mr. B. P. Mann advanced the cash, $29.49. On volume 2 the deficiency, made up by an advance of cash by Dr. G. Dimmock, is $252. 66. The Club's account for the years 1880-1882, during which time PSYCHE (v. 3) was published by Dr. Dimmock, shows a surplus of $32.59, which the Treasurer recommends to be added to the Permanent publication fund. On the account of volume 4 of PSYCHE there is a deficit, 1 Jan. 1884, of $29.90, which is made up by advances by Mr. Mann. The principal of the Permanent publication fund is $224.39, deposited in the Cambridge Savings Bank and drawing an annual interest of four per centum.

The Librarian reports almost exactly one thousand titles in the library, and an increased list of exchanges for PSYCHE.

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8 Feb. 1884.—The 99th meeting of the Club was held at 19 Brattle St., Cambridge, 8 Feb. 1884. The meeting was called to order by the President, Mr. S. H. Scudder, at 7.50 P.M. Three members were present.

The Secretary announced the withdrawal from the Club of Mr. William Barnes, of Cambridge, and the letters from Messrs C. C. Beale, W. L. Devereaux, and J. G. Jack accepting membership. The Secretary called attention to the fund which it is proposed to raise in honor of the late Dr. Hermann Müller, of Lippstadt, Germany.

Dr. G. Dimmock called attention to some curious habits of *Forficula auricularia*, a specimen of which he had kept in confinement several months. These insects are omnivorous, but apparently prefer insects as food, eating their own species greedily. Altho to all appearances blind, except to the presence or absence of light, the specimen above mentioned captured fleas (*Pulex irritans*) with ease in a circular enclosure about 5 cm. in diameter. No notice was taken of a flea put in the enclosure until the flea actually touched the forficula, when the latter would rush after the flea, palpitating rapidly with the antennae, and thus keeping on his track. If the flea escaped from beneath the antennae of the forficula the latter would find him again in a moment, and the amusing chase would be renewed, to end in the sure seizure of the flea in the mouth-parts of the forficula. The forficula was a glutton and would often eat a large number of fleas or other insects in succession, at the end of his repast his abdomen being much distended.

Mr. S. H. Scudder exhibited a specimen and drawings of an arachnid from the coal-measures of Arkansas. Two years ago Karsch figured a similar form from the coal of Prussian Silesia, under the generic name *Anthracomartus*, and Kusta has just described another from carboniferous beds in Bohemia. This adds another to the many instances in which a new generic type of carboniferous arthropods had no sooner been announced as found on one continent than it was discovered on the other. The Arkansas species was obtained by Prof. T. S. Harvey of Fayetteville, and had not been in Mr. Scudder's hands a month before a second American species was found by Mr. R. D. Lacoe in the well-known bed of Mazon creek, Ill.

Dr. G. Dimmock showed an alcoholic specimen of the larva and pupa of *Lutanus dama*.

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard; S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Axon, W: E. A. Dipterous larvae in the human subject. (Entomologist, July 1882, v. 15, p. 164-165.)

Abstract from *British medical journal*, 1 Oct. 1881, in regard to the occurrence of a larva of an unknown dipteron beneath the skin of a girl. *G: D.* (3505)

Barnard, W: Stebbins. Eggs of *corydalus cornutus*. (Amer. entom., July 1880, v. 3, n. s., v. 1, p. 178, 6 cm.)

Corroboration of conclusions as to the eggs and early development of *corydalus cornutus* set forth in C: V. Riley's "On the larval characteristics of *corydalus* and *chauliodes*" . . . (Kansas City review of science and industry, Sep. 1878, v. 2, p. 354) [Rec., 3535]; the egg-masses of *c. cornutus* deposited on the vertical, sun-exposed faces of rocks over water, at Ithaca, N. Y.; eggs hatch at Ithaca during the last half of August.
B: P. M. (3506)

Collier, P: Report of the chemist. (Ann. rept. [U. S.] commissioner agric., for 1878, [22 Nov.] 1879, p. 95-156.)

Contains statements (p. 96, 97) that analyses had been made of the white covering of the eggs of *corydalus cornutus*, of so called bombic acid, and of London purple as a substitute for Paris green as an insecticide; (p. 134, 144) statements of results of these analyses.
B: P. M. (3507)

Comstock, J: H: A fragment of a Guide to practical work in elementary entomology, an outline for the use of students in the entomological laboratory of Cornell university. Ithaca, N. Y., 1882. t.-p. cover+t.-p., 35 p., 22×15.

Notice. (Entomologist, June 1882, v. 15, p. 144.) Rev., by B: P. Mann, entitled "Review." (Psyche, June-July 1884, v. 4, p. 185.)

Consists of chapter 1, "Terms denoting position and direction of parts," and chapter 2, "The external anatomy of a grasshopper," of part 1, "Anatomical nomenclature," of author's proposed "Guide to practical work" etc.; need of and suggestions for the improvement of anatomical nomenclature; descripture of the external anatomy of *caloptenus femur-rubrum*.
B: P. M. (3508)

Douglas, J: W: Measurements in descriptive entomology. (Entom. mo. mag., Mch. 1882, v. 18, p. 236-237.)

Crit. rev., by R. McLachlan, with same title. (*op. cit.*, p. 237-238.)

Crit. rev. of R. McLachlan's "Measurements in descriptive entomology; a suggestion" (*op. cit.*, Feb. 1882, p. 205-207); considers the Paris line [2.25 mm.] a standard of measurement for insects, and opposes the use of the millimetre as a unit. *G: D.* (3509)

Frenzel, Johann. Der Verdauungstractus der Larve des *tenebrio molitor*. Vorläufige Mittheilung. (Zool. Anzeiger, 1 May 1882, jahrg. 5, p. 215-217.)

Anatomical and physiological notes on the digestive tract of the larva of *tenebrio molitor*. *G: D.* (3510)

Haldeman, S: Stehman. History and transformations of *corydalus cornutus*. (Mem. Amer. acad. arts and sci., 1849 [Jan. 1850], p. 162-168, pl. 1-3.)

Habits and external anatomy (with especial reference to the mouth-parts and genitalia) of *corydalus cornutus*.
G: D. (3511)

LeConte, J: Lawrence. Lists of coleoptera collected in 1881 by Dr. Bell and others, in the Lake Superior district and in the north-west territories, east of the 112th meridian and south of the 60th parallel. (Rept. of progress of Geol. and nat. hist. surv. Canada, 1880-1882, Montreal, 1883, 290-390.)

Gives lists of coleoptera from 11 places about Lake Superior. *G: D.* (3512)

Leidy, Joseph. Internal anatomy of *corydalus cornutus* in its three stages of existence. (Mem. Amer. acad. arts and sci., 1849 [Jan. 1850], p. 162-168, pl. 1-3.)

Describes the digestive apparatus of the larva, pupa, and imago of *corydalus cornutus*, and the generative apparatus and nervous system of the imago of the same insect. *G: D.* (3513)

McLachlan, Robert. Measurements in descriptive entomology. (Entom. mo. mag., March 1882, v. 18, p. 237-238.)

Reply to J: W: Douglas' "Measurements in descriptive entomology" (*op. cit.*, p. 236-237); the extent to which the metric system is now used precludes the probability that Paris or English lines will ever become general standards of measurement; the use of Paris lines by British writers is especially objectionable.
G: D. (3514)

McLachlan, Robert. Measurements in descriptive entomology; a suggestion. Entom. mo. mag., Feb. 1882, v. 18, p. 205-207.)

Crit. rev., by J: W: Douglas, entitled "Measurements in descriptive entomology." (*op. cit.*, Mch. 1882, p. 236-237.)

Urges British entomologists to use millimetres as units in measurement of insects. *G: D.* (3515)

Meade, R. H. Note on parasitic diptera. (Entomologist, June 1882, v. 15, p. 140-141.)

Cyrtoneura stabulans, which is said to live generally on fungi, is, according to C: V. Riley, parasitic on the cotton worm, *aletia argillacea*. *G: D.* (3516)

Observations on the sagacity of the spider (Amer. museum . . . Carey . . . . Oct. 1791, v. 10, no. 4, p. 203-204, 31 cm.)

Treats of the habits and web-building of spiders.
B: P. M. (3517)

Osborne, J. A. Further notes on parthenogenesis in coleoptera. (Entom. mo. mag., Nov. 1881, v. 18, p. 128-129.)

Statistics of parthenogenetic reproduction as observed in *gastrophysa raphani* and compared with reproduction from impregnated females. *G: D.* (3518)

Osten Sacken, C: Robert. Dr. F. Müller's discovery of a case of female dimorphism among diptera. (Entom. mo. mag., Nov. 1880, v. 17, p. 130-132.)

Crit. rev. of F. Müller's "Paltostoma torrentium Eine mücke mit zweigestaltigen weibchen" (Kosmos, Oct. 1880, jahrg. 4, bd. 8, p. 37-42); *paltostoma torrentium* perhaps not a *paltostoma;* geographical distribution of this genus and of the family *blepharoceridae* which differs from most other families of diptera in having the eyes contiguous in some genera and separate in others, but alike, so far as known, in both sexes, in this regard; references to literature on *blepharoceridae*.
B: P. M. (3519)

Osten Sacken, C: Robert. Habits of *bombylius*. (Entom. mo. mag., Feb. 1881, v. 17, p. 206-207.)

Rev. of C: V. Riley's "On the natural history of certain bee-flies, *bombyliidae*." (Amer. entom., Dec. 1880, v. 3, n. s., v. 1, p. 279-283) [Rec. 3536]; food-animals of *systoechus*, *triodites* and *bombylius;* summary statement of the mode of oviposition of *bombylius*, *lomatia* and *anthrax*, with references to the literature.
B: P. M. (3520)

[Packard, Alpheus Spring.] The horned corydalus. (Amer. nat., Oct. 1867, v. 1. p, 436-437, fig. 1-2.)

Figure and general description of larva and imago of *corydalus cornutus;* low grade of its structure; habits of larva; eggs unknown; form and position of eggs of *sialis;* probably greater abundance of *sialidae* at the carboniferous period than at present. *B: P. M.* (3521)

Parfitt, E: *Halictus cylindricus* carnivorous. (Entom. mo. mag., Dec. 1882, v. 19, p. 162-163.)

A male of *halictus cylindricus* captured with other insects in his mouth. *G: D.* (3522)

Parthenogenesis bei käfern. (Entom. nachrichten, 15 Jan. 1881, jahrg. 7, p. 31-32.)

Abstract of J. A. Osborne's "Parthenogenesis in the coleoptera" (Nature, 30 Sept. 1880, v. 22, p. 509-510). In the abstract the species is given as "*gastrophacha raphani*." *G: D.* (3523)

Peach, B. N. On some fossil myriapods from the lower old red sandstone of Forfarshire. (Proc. roy. phys. soc. [Edinb.], 1881-1882, p. 177-188, pl. 2.)

Figures and describes *kampecaris forfarensis* and *archidesmus* [nov. gen.] *macnicoli* [n. spec.], apparently the oldest myriapods known. *G: D.* (3524)

Pierce, F. N. Three-winged insects. (Pract. nat., June 1883, v. 1, p. 65, 15 cm.)

Mentions several specimens of lepidoptera which lack one posterior wing. *G: D.* (3525)

Pike, J. W. Preservation of fossil insects and plants on Mazon Creek. ("Vineland [N. J.] weekly independent" . . .) (Science advocate [Atco, N. J.], Oct. 1881, v. 2, p. 57-59, 88 cm.)

General notes on Mazon Creek, Ill., as a source of fossil insects and plants. *G: D.* (3526)

Plowright, C: B. On mimicry in fungi. (Grevillea, Sept. 1881, v. 10, p. 1-14.)

Includes remarks on fungivorous insects and on the dissemination of fungi by insect aid. *W: T.* (3527)

Poisson, J. Sur deux nouvelles plantes-pièges. (Bull. soc. bot. de France, 12 Jan. 1877, v. 24, p. 26-31.)

Abst., by H. Müller, entitled "Ueber zwei neue fallenpflanzen." (Bot. jahresbericht . . . Just, 1877, v. 5, p. 750, 10 cm.)

Abst., by Asa Gray, entitled "The beheading of flies by *mentzelia ornata*." (Bot. gazette, Oct. 1879, v. 4, p. 213-214.)

Describes, as one of the vegetable traps, the barbed hairs and interspersed glandular hairs on the flower-stalk of *mentzelia*. Flies, attracted by the secretion of the first, insert their tongues between the barbed hairs, and are unable to remove them. In their efforts to escape they often twist their bodies from their heads.
W: T. (3528)

Potato bugs. (New remedies, Sept. 1881, v. 10, p. 284, 3 cm.)

Use of "potato bugs" [*? doryphora decemlineata*] in homœopathic medicine. *G: D.* (3529)

Ribeaucourt, C. Manuel d'apiculture rationelle d'après les méthodes modernes. 3e édition revue et augmentée. Paris, 1880. t.-p. cover, 126 p., 15×11, t 11×6.7.

General work on apiculture. *G: D.* (3530)

Riley, C: Valentine. On the curious egg mass of *corydalus cornutus*, Linn., and on the eggs that have hitherto been referred to that species. (Proc. Amer. assoc. advanc. sci., for 1876, 1877, v. 25, p. 275-279, 1 fig.)

Reprint, by author, entitled "The hellgrammite. *Corydalus cornutus*, Linn. (9th ann. rept. state entom. Mo., 1877, p. 125-129, fig. 30-33.)

Structure and habits, description of egg-masses and eggs and of newly-hatched larvae of *corydalus cornutus;* eggs formerly atiributed to this species are probably those of *belostoma grande;* figure of these eggs and of the imago of *b. grande.* *B: P. M.* (3531)

Riley, C: Valentine. The hellgrammite. (Sci. amer., 23 June 1877, v. 36, p. 392-393, 120 cm. 3 fig.)

Structure and habits of *corydalus cornutus*, description and figures of egg-masses, eggs, larvae, pupa and imagos of this species; adaptations of sexual structure to varying conditions; figure and description of eggs of *belostoma grande*, formerly supposed to be those of *c. cornutus.* *B: P. M.* (3532)

Riley, C: Valentine. The hellgrammite. *Corydalus cornutus*, Linn. (9th ann. rept. state entom. Mo., 1877, p. 125-129, fig. 30-33.)

Reprint of author's "On the curious egg mass of *corydalus cornutus*" . . . (Proc. Amer. assoc. advanc. sci., for 1876, 1877, v. 25, p. 275-279), with addition of figures of imago, pupa and full-grown larva of *corydalus cornutus* and of imago and eggs of *belostoma grande;* structure and habits, description of egg-masses and eggs and of newly-hatched larvae of *corydalus cornutus;* eggs formerly attributed to this species are probably those of *belostoma grande.* *B: P. M.* (3533)

Riley, C: Valentine. The hellgrammite fly: *corydalus cornutus*, Linn. (5th ann. rept. state entom. Mo., 1873, p. 142-145, fig. 69-71.)

Description and figures of larva, pupa and imago of *corydalus cornutus*, and of eggs of *belostoma grande* mistaken for those of the *corydalus;* description of the external respiratory organs of the larva; habits and transformations; adaptation of the jaws of the male imago of this species and of *lucanus elaphus* for embracing the female. *B: P. M.* (3534)

Riley, C: Valentine. On the larval characteristics of *corydalus* and *chauliodes* and on the development of *corydalus cornutus.* (Kansas City review of science and industry, Sep. 1878, v. 2, p. 354.)

Reprint. (Can. entom., May 1879, v. 11, p. 96-98.)

Reprint. (Proc. Amer. assoc. advanc. sci., for 1878, [14 July?] 1879, v. 27, p. 285-287.) (RILEY, C: V. Entomological papers. . . . [From the Proceedings (etc.), St. Louis, Mo., August, 1878.] [Salem, Mass., Feb. 1879.] p. 19-21.)

Abstract of paper read by the author at meeting of American association for the advancement of science, Aug. 1878; characters and economic value of larva of *corydalus cornutus*, with brief indication of characters of imago; characters of larva of *chauliodes;* description of eggs of both genera; peculiar situation of egg-masses of the *corydalus* and physical character of their covering; describes particularly the respiratory apparatus and method of respiration of the *corydalus* larvae. [The reprints include a few verbal corrections.] *B: P. M.* (3535)

Riley, C: Valentine. On the natural history of certain bee-flies, *bombyliidae.* (Amer. entom., Dec. 1880, v. 3, n. s., v. 1, p. 279-283, fig. 147-151.)

Rev., by C: R. Osten Sacken, entitled "Habits of *bombylius.*" (Entom., mo. mag., Feb. 1881, v. 17, p. 206-207.)

Advance reprint and abstract of p. 262-269 of 2d report of U. S. entomological commission, chap. 13 [Rec., 3291*n*], with approximate copies of figs. 1, 1b-1g, 2a, 3, 5a and 7 of pl. 16; larval habits and figures of several stages of *triodites mus* and *systoechus oreas*, with history of their discovery; description and figures of mouth-parts of the larvae; review of previous knowledge of habits of larvae of *bombyliidae*, with references to the literature; distinctive characters of cells and cocoons of *pelopoeus* and *trypoxylon;* habits of *trypoxylon albitarse;* retardation of development in parasitic insects. *B: P. M.* (3536)

Roth, Albrecht Wilhelm. Von der reizbarkeit der blätter des sogenannten sonnenthaues, *drosera rotundifolia*, *longifolia.* (Beyträge zur botanik, Bremen, 1782, theil 1, p. 60-76.)

Describes the capture of insects by the leaves of *dionaea muscipula*, as well as by *drosera rotundifolia* and *d. longifolia*, recording several experiments on the latter genus. *W: T.* (3537)

Rüst, —— Eine einfache käferfalle. (Entom. nachrichten, 15 April 1880, jahrg. 6, p. 84-85.)

Mode of constructing a trap, baited with dead animals, for collecting carnivorous and carrion-eating coleoptera. *G: D.* (3538)

Sang, J. *Platyptilia dichrodactyla* and [*p.*] *bertrami*. (Entom. mo. mag., Nov. 1881, v. 18, p. 143-144.)

Discusses the synonymy of *platyptilia dichrodactyla* and *p. bertrami*, and gives notes on the early stages of *p. dichrodactyla*. *G: D.* (3539)

Saunders, W: Entomology for beginners. The promethea emperor-moth. *Callosamia promethea*, Drury. (Can. entom., Dec. 1883 [Feb. 1884], p. 231-233, fig. 10-13.)

Figures male and female imago, and larva and cocoon of *callosamia promethea* and gives notes upon them. *G: D.* (3540)

Scudder, S: Hubbard. The carboniferous hexapod insects of Great Britain. (Mem. Bost. soc. nat. hist., 1883, v. 3, p. 213-224, pl. 17.)

Separate. Boston, June [Oct.] 1883. t.-p. cover, p. 213-224, pl. 17, 30×23, t 22×16.

Describes *brodia priscotincta* and *archaeoptilus ingens* (2 new genera and species) and *lithosialis brongniartii*, fossil neuroptera; list of carboniferous hexapods (4 neuroptera, 2 orthoptera and 1 coleopteron) from Great Britain. *G: D.* (3541)

Scudder, S: Hubbard. The fossil white ants of Colorado. (Proc. Amer. acad. arts and sciences, 1883, v. 19, p. 133-145.)

General notes on fossil *termitina* and their distribution; describes 1 new genus and 6 new species, viz.: *parotermes* (n. g.), *p. insignis*, *p. hagenii*, *p. fodinae*, *hodotermes? coloradensis*, *eutermes fossarum*, and *e. meadii*, all from tertiary beds of Florissant, Colorado. *G: D.* (3542)

Siewers, C: Godfrey. Some notes on coleoptera for beginners. (Can. entom., July 1880, v. 12, p. 138-139.)

Modes of collecting and preparing coleoptera. *G: D.* (3543)

Stanley, H: M. Through the dark continent, or the sources of the Nile, around the great lakes of equatorial Africa and down the Livingstone river to the Atlantic ocean. 2 v. N. Y., *Harper & Brothers*, 1878. v. 1, 14+522 p.; v. 2, 10+566 p.; 23×15, t 17×9.7. "With 10 maps and 150 woodcuts" and 2 por. of Stanley. Cloth, $10; sheep, $12; half-morocco or half-calf, $15. Sold by subscription only.

Entomological notes, brief and of a popular nature, are found in v. **1**, as follows: p. 72, precautions against white ants [*termes*]; p. 157 and 462, mosquitoes [*culex*]; p. 220-221, general remarks on insects of Musira island, in Victoria Nyanza lake. Vol. **2** contains the following: p. 59-60, 292, 297, 310, 317, and 361, mosquitoes [*culex*]; p. 90, name of lake Niyanja Muta Nzigé means "Lake of dead locusts"; p. 106, 235, 310 and 361, ants and their attacks; p. 121, honey, white-ants and grasshoppers sold in the market at Nyangwé; p. 138, myriapoda, beetles and ants; general notes on the insects at the junction of the Lowwa with the upper Livingstone river; p. 292, and 310, tsetsé and other flies; p. 361, the "jigga" [*sarcopsylla penetrans*]; p. 369, ulcerous diseases conveyed by flies; p. 387 bees and their wax at Mowa on the lower Livingstone river. *G: D.* (3544)

Syme, J: Boswell. On the fertilization of grasses. (Journ. roy. hortic. soc., 17 Apr. 1872, [1873], n. s., v. 4, p. 7-9.)

Remarks on the maturation of the flowers of several genera of *gramineae*, and on the insects which visit these flowers. *Dactylis glomerata*, *psamma arenaria* and *glyceria fluitans* are very attractive to *lepidoptera*, as is evinced by a long list of species taken on their flowers. *W: T.* (3545)

Walsh, B: Dann. Fire-blight. Two new foes of the apple and pear. (Prairie farmer, 6 Sep. 1862, [v. 26], n. s., v. 10, p. 147-149, 189 cm., 7 fig.)

Definition of fire-blight; this disease not caused by attacks of *scolytus pyri*, but suspected to be caused by attacks of *chloroneura malefica* and *ch. maligna*; figures of these insects and of the neuration of the upper and lower wings of their allies; distinctive characters, habits and ravages of these insects; synoptical table to distinguish the genera *typhlocyba*, *empoasca* n. g., *empoa*, *chloroneura* n. g. and *erythroneura*; description of *typhlocyba aurea*, *t. pallidula*, *t. binotata*, *empoasca viridescens*, *e. consobrina*, *e. obtusa*, *empoa albicans*, *chloroneura abnormis*, *ch. malefica*, *ch. maligna*, *erythroneura australis*, *e. ziczac* and *e. octonotata*, all new species; *hemerodromia superstitiosa* found killing an *erythroneura*. *B: P. M.* (3546)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] The apple-root plant-louse. *Eriosoma* (*pemphigus*) *pyri*, Fitch. (Amer. entom., Jan. 1869, v. 1, p. 81-84, fig. 70-72.)

Habits and ravages, description and figures, enemies and parasites of and means against *schizoneura lanigera*: evidences of the presence of this insect in orchards; doubts whether *eriosoma* [*schizoneura*] *pyri* is the same as *e.* [*s.*] *lanigera*; generic differences between *pemphigus* and *eriosoma*; confinement of *aphididae* to the food-plants peculiar to each; description and figure of larva, puparium and imago of *pipiza radicum* n. sp. *B: P. M.* (3547)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] The asparagus beetle: *crioceris asparagi*, Linn. (Amer. entom., Feb. 1869, v. 1, p. 114-115, 77 cm., fig. 94; p. 144, 1 cm.)

Introduction into United States, natural history, ravages and parasites of and means against *crioceris asparagi*; figure of eggs, larvae and imago of this insect; importance of asparagus culture. *B: P. M.* (3548)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] The boll-worm. *Heliothis armigera*, Hübner. (Amer. entom., July 1869, v. 1, p. 212-214, 92 cm., fig. 150-151.)

Habits, seasons, ravages and food-plants of and means against *heliothis armigera*; description and figures of all stages of this insect. *B: P. M.* (3549)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] The hellgrammite fly. *Corydalis cornutus*, Linn. (Amer. entom., Dec. 1868, v. 1, p. 61-62, 71 cm., fig. 56-57.)

Description of habits and figures of larva, pupa and imago of *corydalus cornutus*; description and figure of eggs of *belostoma grande*, mistaken for those of this insect. *B: P. M.* (3550)

ENTOMOLOGICAL ITEMS.

On account of inability to arrange satisfactorily the material on hand for publication this double numero contains four pages less than is usual. This deficiency will be made up in the succeeding numero.

About the middle of June thick clouds of dragon-flies, *Libellula quadrimaculata* and *L. rufa*, were seen flying east over Moscow, Russia. They were at first mistaken for locusts.

We include in the Bibliographical record several references to *corydalus cornutus*, to accompany the article by Mr. Krauss, on that insect. For earlier references see the Bibliographical record, no. 468, 865 *q*, 971 *i*, 1037 *b*, 1115, 1348, 1401.

In the *Bulletin d'insectologie agricole* for May 1884 appears the first portion of a notice of Dr. C. V. Riley and his work as an economic entomologist, written in anticipation of his third visit to France this year. The notice is entitled "Riley et l'entomologie agraire aux États-Unis."

Dr. H: C. McCook has recently described the cocoon of a species of spider which he calls, provisionally, *Micaria limnicunae*. The peculiarity of the cocoon consists in its being covered with mud, and being suspended by a thread beneath fallen boards. The cocoons were found in Illinois.

Entomology has just suffered a loss in the death, at Copenhagen, early in June, of Prof. J. C. Schiödte, a well known entomological author. Among other entomologists, notices of whose deaths we have seen lately, are Mr. Edwin Birchall, lepidopterist, who died in Douglass, Isle of Man, on 2 May 1884, and Mr. William Prest, lepidopterist, born 7 May 1824, in York, England, and died 7 April 1884 in the same town.

Mr. W: C. Krauss, whose description of the nervous system of the head of the larva of *Corydalus cornutus* we publish at this time, attained *special final honors* in the subject of insect anatomy at his graduation from the Cornell university on 19 June of this year, when he was made a Bachelor of science in the departments of science and letters, and received a licentiate certificate in the medical preparatory course. We hail with pleasure the advent to the ranks of the entomologists in this country of every member who is not content with pinning and exchanging specimens, describing new species and discussing their names, but seeks to advance the knowledge of their essential structure, relations to the rest of the world, and manner of life.

B: P. M.

Dr. Fritz Müller, under title of "Butterflies as botanists" notes in *Nature* for 10 July 1884 that "The caterpillars of *Mechanitis*, *Dircenna*, *Ceratinia* and *Ithomia* feed on different species of *solanaceae* (*Solanum*, *Cyphomandra*, *Bassovia*, *Cestrum*), those of the allied genus *Thyridia* on *Brunfelsia*. Now this latter genus of plants had been placed unanimously among the *scrophularineae*, till quite recently it was transferred by Bentham and Hooker to the *solanaceae*. Thus it appears that butterflies had recognized the true affinity of *Brunfelsia* long before botanists did so." Dr. Müller likewise shows that the close affinity of *Dalechampia* and *Tragia*, two genera of *euphorbiaceae*, "had been duly appreciated by butterflies," altho only lately recognized by botanists.

Prof. Xaver Landerer, of Athens, Greece, writes to the *Deutsch-amerikanische apotheker-zeitung* (15 May 1882, jahrg. 3, no. 5, p. 134):—

"As far as I can determine the manna of the Israelites, with which they are said to have nourished themselves for forty years in the wilderness, comes from *Myrica manni-fera*. The manna is known to be secreted from openings which are made in the leaves of the tree by a gall-insect, *Cynips mannipa-rax*. The manna trickles slowly down and hardens. The monks collect this manna at the present time and eat it as hallowed food. Sometimes strangers are honored with a small quantity as a present.

"This manna should not be confused with the *Mana-mana*, in Arabic *Abel Atse;* these are earth-nuts (*Cyperus esculentus*), which are nearly indispensable as food for the poor Arab people."

GUSTAV WEYMER describes and figures in the Jahresbericht des naturwissenschaftlichen vereins in Elberfeld, Heft 6, two hermaphroditic lepidoptera. One of them, an *Apatura iris*, while really a female has various coloration characteristics of a male. The other specimen, a *Nemeophila russula*, has the right half female, the left male; this specimen is the more striking because the male and female of this species vary strikingly in coloration, size, and form. The same author (*l. c.*) describes and figures varieties of *Papilio machaon*, *Apatura iris*, *Limenitis sibylla*, *Vanessa polychloros*, *Melitaea athalia*, *Argynnis selene*, *Arctia caja*, *Acronycta menyanthidis*, *Hybernia leucophaearia*, and *Biston stratarius*. In the same heft Carl Cornelius gives a list of 2304 species of coleoptera from Elberfeld and its vicinity, adding notes concerning habits and food of numerous species and general remarks on the coleopterous fauna of the region.

SOCIETY MEETINGS.

THE REGULAR meetings of the Cambridge Entomological Club will be held at 7.45 p. m., on the days following:—

10 Oct. 1884.	13 Mar. 1885.
7 Nov. "	10 Apr. "
12 Dec. "	8 May "
9 Jan. 1885.	12 June "
13 Feb. "	

G. DIMMOCK, *Secretary.*

THE NEW YORK Entomological Club meets twice monthly, except in June, July and August, but no special date is fixed for each meeting.

HENRY EDWARDS, *Secretary.*

THE REGULAR meetings of the Entomological Section of the Boston Society of Natural History will be held at N. W. corner of Berkeley and Boylston Sts., Boston, Mass. at 7.45 p. m., on the days following:—

22 Oct. 1884.	25 Feb. 1885.
26 Nov. "	25 Mar. "
24 Dec. "	22 Apr. "
28 Jan. 1885.	27 May "

EDWARD BURGESS, *Secretary.*

THE REGULAR meetings of the Entomological Section of the Academy of Natural Sciences, of Philadelphia, Pa., will be held at S. W. corner of 19th and Race Sts., on the days following:—

10 Oct. 1884.	13 Mar. 1885.
7 Nov. "	10 Apr. "
12 Dec. "	8 May "
9 Jan. 1885.	12 June "
13 Feb. "	

JAMES H. RIDINGS, *Recorder.*

THE SEMI-ANNUAL meetings of the American Entomological Society will be held at S. W. corner of 19th and Race Sts., Philadelphia, Pa., on the days following:—

8 Dec. 1884.	8 June 1885.

JAMES H. RIDINGS, *Recording Secretary.*

THE REGULAR monthly meetings of the Montreal Branch of the Entomological Society of Ontario, will be held at Montreal, Que., Canada, on the days following:—

7 Oct. 1884.	3 Feb. 1885.
4 Nov. "	3 Mar. "
2 Dec. "	7 Apr. "
6 Jan. 1885.	5 May "

G. J. BOWLES, *Secretary.*

THE MONTHLY meetings of the Brooklyn Entomological Society will be held in the rooms of Wright's Business College, Broadway, corner of Fourth Street, Brooklyn, E. D., the last Saturday of each month except July and August.

F. G. SCHAUPP, *Secretary.*

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CONTENTS:

ADVERTISEMENTS 194
NOTES ON THE RELATIONS OF TWO CECIDOMYIANS TO FUNGI—*William Trelease* . 195-200
WANT OF SYMMETRY AMONG INSECTS—*Oskar Paul Krancher* 200-203
FOOD-PLANTS OF BEETLES BRED IN MARYLAND—*Otto Lugger* 203-204
EFFECT OF CYANIDE UPON COLOUR 204
FRANCIS GREGORY SANBORN 205
NOTICE OF AN OMISSION FROM LECONTE'S EDITION OF THOMAS SAY'S WRITINGS—*L. O. Howard* 206
A BUTTERFLY ATTRACTED BY LAMPLIGHT—*Mary Esther Murtfeldt* . . . 206
PROCEEDINGS OF SOCIETIES—Linnean Society of London 206
BIBLIOGRAPHICAL RECORD, no. 3551-3590 207-210
ENTOMOLOGICAL ITEMS—Acknowledgment of Contributions 211-212

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PSYCHE.

NOTES ON THE RELATIONS OF TWO CECIDOMYIANS TO FUNGI.

BY WILLIAM TRELEASE, MADISON, WISC.

For some years, while collecting the commoner *uredineae* or rust fungi, my attention has been attracted by certain small orange-red insects, that are very frequent in and about some of the sori. They are most often noticed in the aecidia or cluster-cups and in those sori which contain uredo-spores. At times they are so abundant that it is almost impossible to collect a specimen of the commoner uredo or aecidial forms without finding numbers of them in nearly every sorus.

A first glance at them suggests that the insects may be some species of *Thrips*, but the resemblance vanishes on closer examination. Their motions, as a general thing, are less rapid than those of *Thrips*, and a hand-lens at once shows them to be some sort of dipterous larvae. With a higher power the breast-bone, characteristic of cecidomyid larvae, is distinctly seen. Various attempts have been made to bring them to maturity, but so far without success, so that it is as yet impossible to say anything definite about the species to which they belong.

The constant presence of these insects on the fruit of the fungi led me to watch their movements from time to time, and the reason for their presence was soon seen in the altered appearance of the sori where they were most numerous. Their relish for the spores is entirely disproportionate to the size of their minute bodies. The fact that they feed on the spores affords a simple explanation of their presence on the aecidial and uredo fruits, rather than in the teleutosporic sori of the rusts, since the spores of the latter are more frequently thick-walled and hard.

The fungi on which I have most often observed the larvae in question are *Aecidium caladii*, the cluster cup of *Arisaema* and other aroids, *Coleosporium sonchi-arvensis*, the common rust of *Aster* and *Solidago*, and *Caeoma nitens*, the destructive red-rust everywhere abundant in spring on leaves of the blackberry and raspberry (*Rubus*).

Mr. C. V. Riley informs me that he has also found the same larvae on a fungus (*Exobasidium vaccinii?*) growing on *Azalea*, and that they have been

seen absolutely swarming on some flesh-colored fungus covering a squash, *Cucurbita*. The same, or very similar insects occur also in Europe, for M. Patouillard, speaking of *Caeoma euonymi* and *Aecidium convallariae* in the vicinity of Paris, says that their spores are frequently devoured by a small larva of an orange color.[1]

These larvae differ in their fungivorous habits from the greater number of cecidomyians, which feed on the juices of phaenogams, causing atrophy, as in the case of wheat attacked by *Cecidomyia destructor*, the hessian fly, or the development of galls such as most of the *cecidomyidae* produce. Some species, notably *Cecidomyia tritici*, the wheat fly, feed upon pollen, at least in the early part of their lives, in this respect approaching the species which eat spores. Aside from these, there are a few anomalous feeders in the genus. Westwood[2] states, on the authority of Vallot, whose work I have been unable to consult, that the larvae of one species are found on the under side of leaves of *Chelidonium*, sucking the acari found there; and *Cecidomyia bicolor* Meig. is said by Macquart to frequent the underside of the leaves of *Leonurus*, possibly for a similar purpose.

While the fungus-eating species are not sufficiently restricted in their choice of food to be classed as entirely injurious or entirely beneficial, they would naturally fall among the useful species. Even the golden-rods and asters are of some importance to bee-keepers, and the onslaughts of the insects on the spores of the raspberry rust and other parasites of cultivated plants must tend to check the spread of these fungi, so that in a measure they protect the flowering plants on which they live, as does the species referred to by Vallot.

Entomologists are familiar with certain black spots, several millimetres in diameter, in the leaves of golden rods and asters. *Solidago lanceolata* and *S. tenuifolia* are more frequently marked in this manner than other species. These objects are found in the cabinets of economic entomologists as the galls of a gnat, *Cecidomyia carbonifera* O. S. They also occur in the herbaria of mycologists as fungi, under the names *Rhytisma solidaginis* and *R. asteris* given them a half century ago by Schweinitz.

On narrow-leaved species of *Solidago*, *e.g.*, *S. lanceolata*, the spots, visible on both surfaces of the leaf, are sometimes almost circular, varying in diameter from 1 to 4 mm.; but more commonly they are elongated parallel to the axis of the leaf, so as to be elliptical or oblong. They are usually symmetrical, unless the centre is situated at one side of the midrib of the narrow leaf, in which case the corresponding side is necessarily truncated on reaching the margin. The leaf is always slightly swollen in the discolored spot, but

[1] Bull. soc. bot. France, 28 May 1880, v. 27, p. 162.

[2] Introd. to mod. class. insects, v. 2, p. 510.

the enlargement occurs so uniformly in all parts that neither the midrib nor lateral nerves are obliterated. Now and then spots of the same nature are seen on the stem, where they are more irregular than on the leaf, and commonly occupy somewhat swollen portions of the internodes. The surface of the spot is of a dead coal-black, occasionally slightly glossy on the nerves. Sometimes the black passes into a deep purple at the edge of the spot, due to the presence of a soluble pigment in the diseased epidermal cells, this color changing gradually into the green of the surrounding leaf. In other cases it is bordered by a narrow white ring, forming a sharp line of demarcation between the black on the one hand and the green on the other, or more rarely separating the black from a purple zone, which gradually passes into the green.

On broader leaved species, like *Solidago ulmifolia* and *S. caesia*, the spots are more frequently round or slightly irregular, extending without interruption over the smaller veins or even the midrib. Though often glistening, they usually lack the coal-black appearance noticeable on *S. lanceolata*, and the reason for this is in some instances detected in a very delicate, whitish membrane, clearly continuous with the white or yellow border, which covers and modifies to a greater or less degree the black of the underlying parts. While some of the spots are no thicker than the unaffected portions of the leaf, others are strongly convex on one or both sides.

It has been said that Schweinitz called these fungi, and two species were made of them, characterized by their external features as follows: —

2034. ***Rhytisma solidaginis***, L. v. S., vulgatissimum in foliis vigentibus Solidaginis lanceolatae nec alibi. . . R. innatum, aterrimum, absque ullo velo aut nitore, orbiculatum aut ovatum, margine luteo in folio; in pagina superiori convexum, in inferiori concavum; diametro 1-6 linearum. Saepe plura confluunt—sed apertum non vidi.

2035. ***R. bifrons***, L. v. S., rarum in folio Solidaginis sempervirentis. . . R. innatum, amphigenum, orbiculatum, gregarium aut subconfluens, convexum in ambabus paginis et satis crassum, margine in folio exalbescente. Sursum indutum cortice aut velo crassiore fusco-grisea exteriori, demum frustulis soluto, cortice interiori atra, intus carbonaceum. Diametro trilineari. Interdum perforatum invenitur, an casu?—ceterum inapertum.— *Schweinitz*, Synopsis fung. Amer. bor. (Trans. Amer. philos. soc., 1831, n. s.,v. 4, p. 241.)

The spots on *Aster* leaves resemble those on the broad leaved species of *Solidago* in their general appearance, and vary even on the same plant from plane to strongly plano- or bi-convex. They are either entirely marginless or with a white or yellow border from 0.2-2 mm. in width. Occasionally the border is more or less tinged with red; this is especially the case where it is very broad. As with some specimens of the preceding species, the degree of convexity increases with age, the central portion of some spots being nearly hemispherical. Schweinitz at first referred this to the fungus genus *Xyloma*, but afterward transferred it to *Rhytisma*, and characterized it as follows: —

271. ***Xyloma asteris*** Sz. X. minus oblongum tenuius subeffiguratum rugosum nigrum opacum, ambitu suo folium decolorans. In foliis vigentibus Asteris tradescanti et aliorum rarissime. Initio et ipsum velo tenuissimo cinereo subtectum, rugosum, absque splendore.— *Schweinitz*, Syn. fung. Carol. Super., (1822), p. 53.

2033. ***Rhytisma asteris*** L. v. S., Syn. Car. 271, passim in foliis variorum Asterum . . Species quam distincta. R. innatum exacte orbiculatum, margine latiusculo exalbescente, ambitu lobato, amphigenum, atrum sed expers nitoris, teniusculum, punctulatum: diametro bilineari, primum velo tenuissimo cinereo tectum demum evanes-

cente. Dehiscens non mihi obvium. In planta ubi occurrit plerumque frequenter infestat folia. -*Schweinitz*, Syn. fung. Amer. bor. (*op. cit.*, p. 241.)

It has been seen that the single or double convexity of these galls is not available as a distinctive character, although Schweinitz makes use of it. One of the most obvious superficial characters is the presence or absence of a white, gray or yellow membrane over the carbonized portion of the leaf. This, the *velum* of Schweinitz, is however by no means constantly absent or present in the same species, if we except that on *Solidago lanceolata*, where I have never seen it. On the same plant of *S. ulmifolia* some spots are black, while others are invested on both surfaces by the yellowish-white indusium; and one of the Osten Sacken types of the gall of *Cecidomyia carbonifera*, on a broad leaved *Solidago*, for an examination of which I am indebted to the courtesy of Dr. H. A. Hagen, is black above, with a narrow white border, while below it is completely covered by a white indusium, broken here and there as if by accident. With age this membrane frequently breaks away, but in the specimens to which the preceding statements refer the leaves were intact, and its absence was clearly not due to removal.

In their microscopic characters, all of these forms show a general agreement. The parenchyma of the leaf is invaded by a colorless mycelium of thick-walled hyphae, which lives between the cells and to a certain extent deforms them. It excites little if any hypertrophy, but by crowding the cells apart in its own growth causes the slight convexity of the part of the leaf in which it occurs. Near the surface the mycelial threads become brown, apparently as the result of some chemical action due to the fungus, which also affects the surrounding cells of the leaf, some of which are so completely carbonized that their walls are coal-black. In *R. solidaginis* and the other exindusiate forms, the epidermis is especially influenced by this change, which, however sometimes does not extend so far laterally as in the underlying tissue, — a fact which at once explains the pale border sometimes noticed; the dead but colorless epidermal cells at the margin of the spot, filled with air, appearing white, and contrasting strongly with the carbonized cells on the one hand and with the living ones on the other. The indusium of the other forms is of a similar nature to this border, consisting merely of the dead epidermis, filled with air; but why the epidermis should be blackened in some cases and remain colorless in others it is hard to say.

From what precedes it will be seen that only two of the three so-called species of *Rhytisma* are certainly distinguishable in the specimens that I have examined, viz: *R. solidaginis*, on *Solidago lanceolata* and *S. tenuifolia*, and *R. asteris* (including *R. bifrons*) on *Aster* and the broader leaved species of *Solidago*.[3] Curtis, whose herbarium, containing many Schweinitzian specimens, I have examined, through

[3] The latter are referred by Berkeley to *R. solidaginis* (Grevillea, v. 4, p. 8).

the kindness of Professor W. G. Farlow, was evidently of the same opinion, for his specimens bear only these two names, though some of the last named species occur on *Solidago*, and one, on *Aster gracilis*, agrees very well with the description of *R. bifrons*. Schweinitz, also, says of the three so-called species "Tres species antecedentes memorabiles inter se affines sunt."[4] The fruit of all is unknown. Like that of other species of *Rhytisma*, it does not develop on the living leaf, and I have been unable to look for it on the fallen leaves late in autumn or on the approach of the following spring. Possibly, when found, it may offer a means of distinguishing the so-called species more satisfactorily than can be done at present. Both species are widely distributed over the eastern third of the continent, from the Gulf states to New Brunswick.

The discussion of these objects from a botanical standpoint may appear to some readers unnecessary in an entomological journal, but no account of them would be complete without it. Turning, now, to the entomological side of their history, it remains to be said that several entomologists have bred from them one of the gall gnats — *Cecidomyia carbonifera* Osten Sacken. I, myself, have obtained the adult insects from what I have called *R. asteris*, and they are to be seen in some of the specimens in the Curtis herbarium, which have been broken. The Osten Sacken types, in the Museum of comparative zoology, would also undoubtedly be referred to this species by a mycologist. With the form on *Solidago lanceolata* I have been less successful, having never obtained the imago from it; but in the summer of 1881, while at Woods Holl, Mass., where this form was exceedingly common, I examined several hundred specimens on this plant, by breaking them open, and in every instance a living larva, evidently a cecidomyid, and apparently *Cecidomyia carbonifera*, was found in the substance of the gall, where it lay in a minute cavity. So far as I know, therefore, both insect and fungus are always present in these galls, to whichever species they are referred. While the slight convexity of the young gall is explained by the growth of the fungus, the hemispherical enlargement in many cases, especially on asters, seems to be caused by the insect, and these very thick spots, so far as I have examined them, always contain fully grown insects.

The first published intimation that these spots on *Aster* and *Solidago* are not simply insect galls or simply fungi, that I have noticed, is by Mr. W. R. Gerard,[5] who, doubting their fungoid nature, sent specimens to Mr. C. V. Riley, and was told that (at least so far as the forms on *Solidago* are concerned) they are the galls of *C. carbonifera*. Professor C. H. Peck also makes a similar statement in one of his later reports on New York fungi.[6] Interested in the subject by these notes, I have examined

[4] Syn. fung. Am. bor., *l. c.*, p. 241.

[5] Bulletin Torrey bot. club, Oct. 1876, v. 6, p. 114 [PSYCHE, Rec., no. 2404].

[6] 30 Rept. N. Y. Cab. nat. hist., p. 81.

a large number of specimens from different parts of the country, and without exception have demonstrated their composite nature.

This compound character of the galls implies a close interdependence between the fungus and insect. That *Rhytisma solidaginis* or *R. asteris* cannot occur without the presence of *Cecidomyia carbonifera*, or *vice versa*, cannot be said; yet I have never seen one without the other. Only a study of the development of the galls can show whether the insect paves the way for the fungus or lives only in leaves previously attacked by the latter; but the great powers of multiplication and dissemination possessed by most fungi incline me to the belief that the former is the case, the mycelium being unable to penetrate the uninjured plant, as Hartig has shown to be the case with parasitic species of *Nectria*, etc. From the carbonization of all the species of *Rhytisma*, it is probable that the color of the galls in the present instance is due to the fungus.

The form of fruit of the *Rhytisma*, and the early development of the galls, could be easily made out by any collecting entomologist or botanist living in the eastern states, where they occur; and as I no longer have access to good material these notes are published in their present incomplete form to draw attention to a very interesting subject for further study.[7]

[7] Sections of an undetermined cecidomyid gall on *Impatiens fulva*, from Medford, Mass., prepared in my labaratory by Miss L. N. Martin, show a mycelium somewhat similar to that noticed in *Aster* and *Solidago* leaves, and there is also a certain amount of carbonization. It will be interesting to observe whether the mycelium is always present in this gall which is not uncommon.

WANT OF SYMMETRY AMONG INSECTS.

BY OSKAR PAUL KRANCHER, LEIPZIG, GERMANY.

The extraordinary symmetry which occurs among insects is usually brought prominently forward in most of the books which treat of entomology. Nothing is pictured more symmetrically than, for instance, the structures of bees and ants, or the color of butterflies, which latter is prominently reputed to have a perfectly symmetrical bilateral equality. Although there is much truth at the bottom of all this, although nature in many cases works with great symmetry, yet it must not be overlooked that even this symmetry is often converted into its strict opposite. Surely no observing lepidopterologist has failed to notice that the coloration of the wings of his favorites is to be recognized as strictly symmetrical only in the smallest number of cases, that, indeed, that of one side, which certainly resembles that of the other in its superficial aspect, still shows many differences in its details, and there is little foundation for asserting that they are symmetrical. I might cite innumerable examples of this, but the reader can better see them for himself. This is most plainly shown in the

species of *Vanessa*, *Argynnis*, *Melitaea*, *Arctia*, etc. I have found this also very striking in *Papilio machaon*, a specimen of which, now in my collection, has a distinct black spot in the first yellow area at the tip of the left front wing, while, as usual, there is no such spot on the right wing.

In how diverse a manner nature works, moreover, in the different animals of one and the same species, in animals which are sought for as so-called varieties, a striking proof is given by collections which contain often ten or twelve or even more specimens of one and the same animal. How long one has to hunt among duplicates in order to find two butterflies which are perfectly alike! This field of inquiry has interested me to an unusual degree for a long time and I have had the good fortune to obtain many interesting results in it. Here again *Papilio machaon*, *Arctia caja*, different noctuids and geometrids (for instance, *Abraxas grossulariata*), have excited my special delight by their peculiarly diverse clothing.

But the so-called gynandromorphs, especially those of the lepidoptera, are yet far more remarkable. As is well known, these are animals which show the coloration and structure of one sex on the right wings, and those of the other sex on the left wings. Of course these can only be observed in such animals as show some kind of difference between the coloration and shape of the wings, or the form and structure of the antennae, in the two sexes. A few years ago a gynandromorph of *Endromis versicolora* was found here in the neighboring village of Leina. This, after various wanderings, is now deposited in the Natural history museum at Altenburg. Gynandromorphs of *Ocneria dispar*, *Smerinthus populi*, etc., are not very rare. I had an opportunity this spring of adding a partial gynandromorph to my own collection. I obtained from a pupa of *Aglia tau*, the "Nagelfleck," a specimen which had one antenna male, the other female, that is to say, one filiform, the other pectinate. In its other characters, especially in the coloration of the wings, the specimen appears throughout to be a female.

Finally some attention may be bestowed upon crippling among insects. My few observations again concern the butterflies. Mutilations often occur in these on one side only, and on account of this unfortunate circumstance the specimen which had been so carefully nursed as larva and pupa is entirely useless for the collection, and is ill-humoredly thrown aside by the raiser unless it is kept in spirits to furnish occasion for subsequent observations. The collector is still more displeased with those specimens which have the wings of both sides crippled. Even if such specimens are not well suited for breeding purposes, and so deny various uses to the one who has raised them, yet for other reasons I should not want to condemn such a specimen without further consideration. In spite of all apparent irregularity, nature often works quite regularly, as is well shown by the annexed figure. This specimen was going to be thrown away together with several other cripples, when Mr. Reich-

ert, of Leipzig, who had raised it, recognized its wonderfully regular crippling, and of course spread the specimen and so made clearly manifest that perfectly symmetrical incision in the fore and hind wings. The undulate nerves

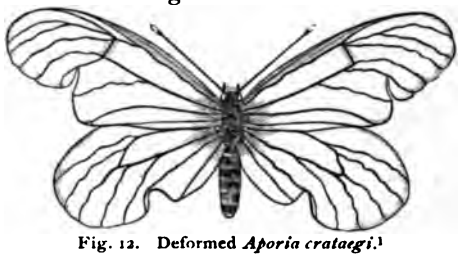

Fig. 12. Deformed *Aporia crataegi*.[1]

of the wings of this specimen appear remarkable at the same time, as the figure represents. *Aporia crataegi*, which is the butterfly mentioned, is a well known species, so that I need not say much about it. The caterpillar, which is found moderately common in this vicinity, lives especially on *Crataegus oxyacantha*, *Prunus spinosa* and *P. domestica*, species of *Pyrus*, etc. At the end of five or six weeks from the time of hatching of the eggs, the caterpillar pupates by fastening its anal extremity and then maintaining itself in a horizontal position by means of a thin thread around the thorax. After fourteen days more the butterfly emerges.

It seemed that it would be interesting to ascertain the cause of these regular notchings, and so we found in the pupa-case from which this butterfly came, that the thoracic girdle had been drawn exceedingly tense, and so firmly, besides, that a sort of depression was to be found in the pupa. From this observation it is easy to conclude that this was the cause of the mutilation that has been mentioned, and since the continuous pressure was here a perfectly uniform one, the irregular development could not but be perfect and uniform. Whether such a mutilation can also be produced artificially with this regularity might be learned from our investigations which are to be instituted for the purpose.

A single glance at a bee-hive will convince one that there are many irregularities also in the colonies of bees. The most regular structures made by bees are the cells, which, as is well known, are so arranged with mathematical exactitude as to accomplish the most with the least material. Worker-cells and drone-cells, both of which serve at the same time as honey-cells, are made in this way, but besides these we find three other different kinds of cells in the commonwealth of bees, of which we may give the name of holding-cells to those which serve to fasten the comb all around to the wall of the hives or to the frames. They are usually only two-thirds formed, the sixth or both the fifth and sixth sides of the hexagon of the cell being wanting. The so-called transition-cells, which constitute the intermediary between the large drone-cells and the smaller worker-cells in one and the same comb show still greater irregularities. They are in shape from four- to nine-angled, for the most part entirely out of place and warped. · Undoubtedly the last two named kinds of cells, in spite of their irregularity, demand our fullest admira-

[1] We are indebted to Mr. Otto Heidemann, xylographer in the U. S. Department of agriculture, for his generosity in transferring this illustration to wood, and engraving it. [Eds.]

tion, since they give proof that the bees know how to help themselves under all circumstances, that they understand how to overcome any obstacle. The most irregular cell in the bee-hive is the queen-bee cell, in which, as is well known, the queen has to pass her youthful stages. This queen-bee cell is shaped like an acorn, and does not stand horizontally like all the other bee cells, but hangs vertically, with the opening downward.

These few quite imperfect remarks may serve to call attention to some of the so numerous irregularities among insects. I hope they may incite others to further new and more interesting observations.

Leipzig, 15 June 1884.

FOOD-PLANTS OF BEETLES BRED IN MARYLAND.

BY OTTO LUGGER, BALTIMORE, MD.

[The numeros (inserted by the editor) are, for the coleoptera, those of G: R. Crotch's "Check list of the coleoptera of America, north of Mexico" (PSYCHE, Rec., no. 43), and, for the food plants, those of Horace Mann's "Catalogue of the phaenogamous plants of the United States" . . . . Where the species of the food-plant is not stated, the numero expresses a conjecture.]

	BUPRESTIDAE.		
3691.	*Dicerca pugionata*	2574.	Quercus alba.
3726.	*Buprestis apricans*	2658.	Pinus mitis.
3767.	*Chrysobothris azurea*	2579.	Quercus coccinea *var.* tinctoria.
3799.	*Ptosima gibbicollis*	705.	Cercis canadensis.
3801.	*Mastogenius subcyaneus*	2603.	Ostrya virginica.
3814.	*Agrilus lecontei*	1053?	Cornus [florida?].
3825.	" *politus*	575.	Robinia pseudacacia (spines).
	ELATERIDAE.		
3863.	*Tharops obliquus*	2600.	Fagus ferruginea.
4260.	*Corymbites vernalis*	2660?	Pinus? [strobus?].
4310.	" *hamatus*	447.	Rhus toxicodendron.
	RHIPICERIDAE.		
4374.	*Sandalus petrophya*	2574.	Quercus alba.
	CERAMBYCIDAE.		
4925.	*Sphenostethus taslei*	2574.	Quercus alba.
4941.	*Smodicum cucujiforme*	2621?	Salix [alba?]
4943.	*Dularius brevilineus*	2538?	Ulmus [americana?].

4970.	*Oeme rigida*	2658.	Pinus mitis.
4977.	*Gracilia minuta*	2610.	Betula lenta (band around gin-barrel).
5015.	*Elaphidion unicolor*	2595.	Quercus rubra.
5025.	*Tylonotus bimaculatus*	2563.	Juglans nigra.
5047.	*Molorchus bimaculatus*	1053.?	Cornus [florida?]; 818. Amelanchier canadensis.
5070.	*Purpuricenus humeralis*	498?	Acer [dasycarpum?].
5070*a*.	" var. *axillaris*	2579.	Quercus coccinea *var.* tinctoria.
5111.	*Calloides nobilis*	2316?	Fraxinus [americana?].
5113.	*Arhopalus fulminans*	——.	Quercus.
5144.	*Cyrtophorus gibbulus*	2574.	Quercus alba.
5145.	" *verrucosus*	2574.	" "
5146.	*Tillomorpha geminata*	2574.	" "
5155.	*Distenia undata*	——.	Pyrus malus.
5166.	*Centrodera decolorata*	——.	Carya.
5225.	*Leptura emarginata*	2536.	Ulmus fulva.
5253.	" *zebra*	2593.	Quercus prinus.
5256.	" *cordifera*	2598.	Castanea vesca.
5331.	*Hetoemis cinerea*	——.	Maclura aurantiaca. ——. Morus.
5343.	*Acanthoderes morrisii*	1061.	Nyssa multiflora.
5381.	*Dectes spinosus*	——.	Ambrosia.
5405.	*Hippopsis lemniscata*	——.	Ambrosia.
5457.	*Dysphaga tenuipes*	2574.	Quercus alba.
	SPERMOPHAGIDAE.		
5464.	*Bruchus mimus*	705.	Cercis canadensis (seed).

EFFECT OF CYANIDE UPON COLOUR. — A very curious case of artificial colouring in a butterfly has been sent me by a friend. He says that the specimen, a male *Gonopteryx* [*sic*] *rhamni*, was placed in a spare cyanide bottle, and left undisturbed for two years; but that, at some intermediate time, the stopper was tampered with and not properly replaced, so that air was introduced. The result is, that the butterfly is richly coloured with crimson along the costal area, and partially round the other margins of the fore-wings, and has large blotches of the same on the hind-wings. Indeed, the only portion of the wings which is left entirely of the usual brimstone colour is that portion which, in *G. cleopatra*, *is clouded with crimson*. — Chas. G. Barrett, Pembroke: 9th April, 1884. [From *Entom. mo. mag.*, June 1884, v. 21, p. 23.]

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FRANCIS GREGORY SANBORN.

Born 18 Jan. 1838, at Andover, Mass.
Died 4 June 1884, at Providence, R. I.

Francis Gregory Sanborn was the son of Eastman and Mary C. L. (Gregory) Sanborn. His father died in 1859; his mother, to whom he was dutiful and affectionate, in 1883. Mr. Sanborn was a devoted and affable friend to his associates, a genius and a close observer. He used his talents often for the good of others, but little for his own worldly advancement. His interest in natural history was of early development, giving occasion for remark and record in his mother's journal when he was but little more than three years old. It was constant and absorbing, leading him to abandon opportunities for private gain, such as that of succeeding to his father's practice as a dentist, for which he had fitted himself and by which he might have prospered pecuniarily.

Mr. Sanborn was widely known to the entomologists of the eastern United States, and almost constantly engaged in the care or preparation of collections of insects or other objects of natural history belonging to public institutions or private possessors. He was graduated at Phillips academy, in Andover, Mass., in 1858, after a six years' course of study interrupted at times on account of ill health. In October 1858 he found employment in the Massachusetts State cabinet of natural history at the state house in Boston, the collection in which, according to Governor N. P. Banks, he built up. Here he remained, with occasional vacations, until the summer of 1865, being also clerk to C. L. Flint, the secretary of the Massachusetts State board of agriculture. He was engaged in miscellaneous work in the museum of the Boston society of natural history in 1865 and 1866 and as regular assistant from 1867 to 1873, having particular care of the insects, also performing general duties, lecturing, and at times acting as secretary. In 1872 he was a justice of the peace and a member of the school committee in West Roxbury, Mass. At this time also he was instructor in entomology at the Bussey institution, in Jamaica Plain, and lecturer at the Museum of comparative zoology in Cambridge, but was soon afterwards affected with mental trouble which caused his seclusion, at private expense, for about seven months, at the state hospital in Worcester. Here he entered into relations with the Worcester society of natural history, of which he afterwards became curator, an office he held at the time of his death. In 1874 he was an assistant in the Kentucky state geological survey, under Professor N. S. Shaler. In 1876 he was engaged to prepare the entomological exhibit of the United States Department of agriculture for the Centennial exposition at Philadelphia.

He was a member of the American association for the advancement of science, Boston society of natural history, Cambridge entomological club, Essex institute, corresponding member of the American entomological society, Entomological society of Ontario, and New York entomological society, and member of other learned societies.

B. P. M.

CORRESPONDENCE.

NOTICE OF AN OMISSION FROM LECONTE'S EDITION OF THOMAS SAY'S WRITINGS.— In the Journal of the Academy of natural science of Philadelphia, July 1817, v. 1, p. 45-48, Thomas Say, in an article entitled, "Some account of the insect known by the name of Hessian fly, and of a parasitic insect that feeds on it," describes *Cecidomyia destructor* and its parasite *Ceraphron destructor*, and gives a short account of the habits of each species. This article is reprinted correctly in Leconte's edition of Say's writings, v. 2, p. 6-7. On p. 63 of the Journal, for August 1817, however, just before the explanation to the plate, Say inserted a note which Leconte overlooked and which is here republished, both as showing a curious mistake made by Say, and to correct the omission from the "Complete writings." Say says:—

"I forgot to mention in its proper place that the parasitic insect, Ceraphron destructor, which is so commonly mistaken for the Cecidomyia, after the business of propagation is performed, throws off its wings as a useless incumbrance, in this respect resembling some species of the genera Formica, Termes, &c., to which it also bears some resemblance in point of form and appearance; this has led many to suppose that the Hessian-fly is in reality no other than a species of pissmire in its apterous state. T. Say."

Of course Say is mistaken in his statement that the wings were shed after copulation. It not uncommonly occurs among the *pteromalinae* that certain individuals (both male and female) have only rudimentary wings — mere pads which never become developed into wings. This is the case with the species under consideration, the relative proportion of the winged to the wingless individuals varying with the climate and the season.

L. O. Howard.

A BUTTERFLY ATTRACTED BY LAMPLIGHT. I do not remember any published account of the attraction of diurnal lepidoptera by lamplight, except the note by Mr. S. H. Scudder in PSYCHE, v. 1, p. 28 [Rec., 659], but in two instances I have taken specimens of the eyed emperor (*Apatura lycaon*, Fabr.) in this way. After ten o'clock of the evening of 20 August 1882, a perfect, but not entirely fresh, specimen came in at the open window of my sitting-room and was captured with a butterfly net. The other example referred to was taken earlier in the evening, but after the lamps were lighted. The close proximity of a hackberry tree (*Celtis*), on which the larvae feed, accounts for the presence of these insects in the neighborhood, but does not give us the key to their unusual nocturnal activity. *Mary Esther Murtfeldt.*

PROCEEDINGS OF SOCIETIES.

LINNEAN SOCIETY OF LONDON.

20 Dec. 1883.— . . . Mr. J. Maule Campbell showed the web of a spider (*Tegenaria guyonii*) which had been spun in the centre of a pasteboard cylinder; the peculiarity being the manner in which the solid part of the web was medially swung; whereas in this species of spiders it is more usually on the sides of objects.

17 Jan. 1884.— A paper was read by Mr. A. D. Michael on the "Hypopus" question or life history of certain Acarina. From a careful series of experiments and observations he concludes that—true "Hypopi" are not adult animals but only a stage or heteromorphous nymphs of *Tyroglyphus* and allied genera. Nor do all individuals become "Hypopi," which latter stage takes place during the second nymphal ecdysis. It seems a provision of nature for the distribution of the species irrespective of adverse conditions. "Hypopi" are not truly parasitic nor confine themselves to any particular insect. A new adult form described is called by the author *Disparipes bombi*, and he believes there are other species of the genus *Dormadicus* bee-parasites admitted to be adults, though it is uncertain if they are identical with Dufour's *Trychodactylus*.—From J. Murie in *Zool. anzeiger*.

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard: S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Foerste, Aug. F. *Pastinaca sativa* proterandrous. (Bot. gazette, Feb. 1882, v. 7, p. 24, 4 cm.)

Crit. rev., by W: Trelease, entitled "Protandry of *pastinaca*. (*op. cit.*, Mch., p. 26-27, 9 cm.)

The flowers of *pastinaca sativa* are said to be crossed by means of "small coleoptera and other insects." Other *umbelliferae* are said to be protogynous.

W: T. (3551)

Müller, Hermann. Ueber die befruchtung von *symplocarpus foetidus*. (Bot. jahresbericht . . . Just, 1879, v. 7, p. 137, 5 cm.)

Abstract of W: Trelease's "On the fertilization of *symplocarpus foetidus*" (Amer. nat., Sep. [22 Aug.] 1879, v. 13, p. 580-581) [Rec., 1794]. *W: T.* (3552)

Shimer, H: On a new genus in homoptera, section *monomera*. (Proc. Acad. nat. sci. Philad., Jan. 1867, [v. 19], p. 2-11, fig.)

Crit. rev. in B: D. Walsh's "The grape-leaf gall-louse. *Dactylosphaera vitifoliae*, Fitch" (1st ann. rept. acting state entom. Ill., 1868) (Trans. Ill. state hortic. soc. for 1867, 1868, n. s., v. 1; Appendix), p. 21-24.

Characterises the "supposed new family" *dactylosphaeridae*, and the new genera *dactylosphaera* [type: *d. globosum* n. sp.] and *viteus* [type: *pemphigus vitifoliae* Fitch]; describes *d. globosum* n. sp. and *d?* (*viteus*) *vitifoliae*; describes the method used in observing these insects.

[*D. globosum* = *Phylloxera caryaesemen*; *d?* (*viteus*) *vitifoliae* = *Ph. vitifoliae*.] *B: P. M.* (3553)

Shimer, H: The wavy-striped flea-beetle. (Amer. nat., Dec. 1868, v. 1, p. 514-517, fig. 1.)

Extract, [by B: D. Walsh and C: V. Riley], entitled "The wavy-striped flea-beetle. *Haltica* (*phyllotreta*) *striolata*, Illiger." (Amer. entom., Apr. 1869, v. 1, p. 158-159, 62 cm., fig. 119.)

Habits and ravages, food-plants and description and figure of larva and imago of *phyllotreta striolata*.

B: P. M. (3554)

Stillman, J: M. On the origin of the lac [Rec., 2792].

Extract, in Germ. tr., by C. F. Gissler, entitled "Ueber den ursprung des schild-lack's." (Deutsch-amer. apotheker-zeitung, 1 Dec. 1880, jahrg. 1, no. 18, p. 2, 40 cm.) *B: P. M.* (3555)

Tasker, J. C. W. Naphthaline versus camphor. (Entomologist, Oct. 1882, v. 15, p. 240.)

Use of naphthalin ($C_{10}H_8$) recommended as a pestifuge in collections of insects. *G: D.* (3556)

Tilghman, E:, 3d. [Hessian fly.] (Amer. farmer . . . Skinner, 20 Oct. 1820, v. 2, ed. 3, p. 235, 18 cm.)

Process of ovisposition of *cecidomyia destructor* on wheat, described from nature. *B: P. M.* (3557)

Todd, James E. On the flowers of *solanum rostratum* and *cassia chamaecrista*. (Amer. nat., Apr. [22 Mch.] 1882, v. 16, p. 281-287, 3 fig.)

Includes remarks on the cross-fertilization of *solanum rostratum* and *cassia chamaecrista* by *bombus*, which visits them for pollen. *W: T.* (3558)

Townsend, C: H: Tyler. On the variation of the elytral markings in *cicindela sexguttata*. (Can. entom., Nov. 1883, v. 15, p. 205-208, 1 fig.)

Describes the variations in number and arrangement of the elytral spots in *cicindela sexguttata*, making eight varieties of them; table to show the relative number of individuals of each variety out of forty-nine specimens taken during 1883. *G: D.* (3559)

[?**Treat**, Mary.] A chapter on mites. (Harper's new mo. mag., Apr. 1861, v. 42, p. 607-614, fig. 1-11.)

Figures *acarus domesticus*, *a. lacteus*, *a. roseae*, *a. canna-mellifera*, *a. megarhina*, *a. muscida*, *a. contagiosus*, *hydrachna geographica*, *h. globum*, *h. puteus*, and anatomical details of some of these species; figures imago, larva, ovipositor and mandibles of *piophila casei*; with some account of these several insects.

B: P. M. (3560)

[**Treat**, Mary.] More about spiders. (Harper's new mo. mag., Feb. 1861, v. 42, p. 323-335, fig. 1-21.)

Gives enlarged figures of *lycosa gyrophora* and *epeira prasinus*, their eyes and nests; of *theridion schizopoda*, its nest, egg-bag, eyes and claws; of *clubiona filices* and nest; of *epeira filices*, nest, egg-bag, eyes and mandibles; of *ctenus tangeneus*, nest, eyes, mandibles and claws; of *clubiona agaricus*, *drassus perfida*, *lycosa violaceus* and *tegenaria textura* and their nests, mandibles and eyes; of *epeira fasciata*, *theridion migratum*, *phalangium* sp. and *lycosa noctes*, their mandibles and eyes; and of male palpi of two *theridion*, a *segestria*, two *clotho* and an *epeira;* gives some account of these species and of *epeira diadema*, and of the habits, food and fights of some of them. *B: P. M.* (3561)

Trelease, W: On the fertilization of *symplocarpus foetidus* [Rec., 1794].

Reprint, under head, "*Symplocarpus foetidus.*" (GOODALE, G: L. *and* SPRAGUE, I: Wild flowers of North America, 1880, pt. 14, p. 120-121.)

Abstract in F. Delpino's "Impollinazione e fecondazione nel cotone e in altre specie" (Rivista botanica, 1880, p. 45).

Abstract, by H. Müller, entitled "Ueber die befruchtung von *symplocarpus foetidus.*" (Bot. jahresbericht . . . Just, 1879, v. 7, p. 137, 5 cm.) *W: T.* (3562)

Trelease, W: The heterogony of *oxalis violacea*. (Amer. nat., Jan. 1882 [30 Dec. 1881], v. 16, p. 13-19, 5 fig.)

The flowers of *oxalis violacea* are believed to be dimorphic instead of trimorphic. They are visited for nectar by *nomada bisignata*, *ceratina dupla*, *augochlora pura*, *osmia* sp., and *halictus* sp. *W: T.* (3563)

Trelease, W: Protandry of *pastinaca*. (Bot. gazette, Mch. 1882, v. 7, p. 26-27, 9 cm.)

Remarks, apropos of A. F. Foerste's "*Pastinaca sativa* proterandrous" (*op. cit.*, Feb. p. 24) [Rec., 3551], that most *umbelliferae* are strongly protandrous; and states that in Germany the flowers of *pastinaca* are, according to Hermann Müller, visited by hymenoptera and diptera. *W: T.* (3564)

Troop, J. Proterandry in *amaryllis reginae*. (Bot. gazette, Apr. 1882, v. 7, p. 42, 11 cm.)

The flowers of *amaryllis reginae* are said to be probably fertilized by "some moth with a long proboscis." *W: T.* (3565)

Verrill, Addison Emory. Additional observations on the parasites of man and the domestic animals. (5th ann. rept. secr. Connecticut board agric., for 1871-1872, 1872, p. 321-342.)

Additions to the lists of internal parasites of man, cattle, horse, hog and poultry, given in author's "The internal parasites of domestic animals" . . . (4th ann. rept. [etc.], 1870, p. 162-256) [Rec., 3569] with corrections and additional statements concerning some of these parasites; treats mostly of worms, but mentions *pentastoma settenii* as a parasite of the horse and the occurrence of *dermatobia noxialis?* in a woman in Mississippi. *B: P. M.* (3566)

Verrill, Addison Emory. The external and internal parasites of man and domestic animals. [Hartford, Conn., 1870.] t.-p. cover, 140 p., 23X14, t 17X6.5. il.

Reprint, as pamphlet, of author's "The external parasites of domestic animals" . . . (4th ann. rept. secr. Connecticut board agric., for 1869-1870, 1870, p. 72-122, fig. 1-48) [Rec., 3568], and "The internal parasites of domestic animals" . . . (*op. cit.*, p. 162-256, fig. 49-84) [Rec., 3569]. *G: D.* (3567)

Verrill, Addison Emory. The external parasites of domestic animals: their effects and remedies. (4th ann. rept. secr. Connecticut board agric., for 1869-1870, 1870, p. 72-122, fig. 1-48. (VERRILL, A. E. The external and internal parasites of man and domestic animals . . . [1870], p. 1-51, fig. 1-48.)

Characterises the several subclasses of insects and orders of hexapods, with illustrations of each; describes and figures the principal species of *pulicidae*, *hippoboscidae*, *oestridae*, *cimicidae*, *pediculidae*, *mallophaga* and *acarina*, which are parasitic on domestic animals, with some account of their habits, and of means against them, and mention of related species. *B: P. M.* (3568)

Verrill, Addison Emory. The internal parasites of domestic animals; their effects and remedies [with discussion]. (4th ann. rept. secr. Connecticut board agric., for 1869-1870, 1870, p. 162-256, fig 49-84.) (VERRILL, A. E. The external and internal parasites of man and domestic animals . . . [1870], p. 51-140, fig. 49-84.)

Additions and corrections, by author, entitled "Additional observations on the parasites of man and the domestic animals." (5th ann. rept. [etc.], 1872, p. 321-342.)

Characterises the orders *cestoda*, *trematoda*, *acanthocephala* and *nematoda*, to which belong the parasitic worms of man and domestic animals; gives a list of some of the more important general works on parasitic worms; gives lists of the internal parasites of man, dog, cat, sheep, cattle, horse, hog and poultry; describes and figures the principal species of these parasites with accounts of their habits, transformations and ravages and means against them; *pentastoma taenioides*, with its immature form *p. denticulatum*, and *p. constrictum*, which are *acarina*, are here treated of (p. 249-251, fig. 84), and the discussion (p. 252-256) contains remarks on means against *gastrophilus equi* by E. S. Hubbard, N. Cressy, —Sedgwick and author. *B: P. M.* (3569)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] The cotton army-worm. *Noctua* (*anomis*) *xylina*. Say. (Amer. entom., July 1869, v. 1, p. 209-212, 145 cm., fig. 147-149.)

Description and figures of all stages of *aletia xylina*, and civil and natural history of this insect, and means of preventing its ravages, mostly compiled from the writings of T. Glover and from J. B. Lyman's "Cotton culture;" difficulties and dangers in the pursuit of observations in the southern United States; distinctions between various insects severally termed "army-worms." *B: P. M.* (3570)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] The chinch bug. *Micropus leucopterus*, Say. (Amer. entom., 1869, v. 1: May, p. 169-177, 315 cm., fig 122; June, p. 194-199, 221 cm., fig. 135-139.)

Reprint, with changes, by C: V. Riley, entitled "The chinch bug: *micropus leucopterus*, Say." (2d ann. rept. state entom. Mo., [Mch.] 1870, p. 15-37, fig. 1-10.)

Supreme noxiousness of *blissus leucopterus* in grain-field; past civil history and cause of former scarcity of this pest; value of a fore-knowledge of its probable future occurrence; its hibernation, seasons, oviposition, prolificacy, swarming, migrations, dimorphism and ravages, and means against it; its enemies, especially *hippodamia maculata*, *coccinella munda*, *chrysopa plorabunda*, *anthocoris insidiosus* and *ortyx virginiana*; distinctions between insects having and not having complete metamorphoses; differences in number of annual generations and in periods of development of insects; effects of meteoric conditions on insects; fallacy of H: Shimer's theory of the epizootic disease of the *blissus*, and failure of Shimer's prophecies.
B: P. M. (3571)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] The gigantic root borer. *Prionus laticollis*, Drury. (Amer. entom., Aug. 1869, v. 1, p. 231-234, 123 cm., fig. 169-173.)

Description and figure of larva and figure of pupa and imago of *prionus laticollis*; habits, food-plants, ravages and geographical distribution of and means against this species; differences between its imago and that of *p. imbricornis*; figure of imago of *orthosoma cylindricum*; characters of larvae of *prionidae*.
B: P. M. (3572)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] The grape-berry moth. *Penthina vitivorana*. Packard. (Amer. entom., May 1869, v. 1, p. 177-179, 74 cm., fig. 123.)

Remarks on the appearance of new and the disappearance of old pests; recent occurrence of *penthina vitivorana* [*eudemis botrana*] as a pest in grapes; seasons and habits of and means against this insect.
B: P. M. (3573)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] Imitative butterflies. (Amer. entom., June 1869, v. 1, p. 189-193, 202 cm., fig. 132-134.)

General exemption of *danaidae* from and liability of *pieridae* to the attacks of predaceous animals; attempted explanation of these phenomena; protective imitation of *danaidae* by certain *pieridae*; theory of the origin of this imitation; mimicry of *danais archippus* by *limenitis disippus*, and consequent protection of the latter from foes; hibernating habits and description of larva of the *limenitis*, figures of the larva, pupa, imago and hibernaculum of this species; figure of imago of *danais archippus*.
B: P. M. (3574)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] Leafy oak-gall. (Amer. entom., Sept.-Oct. 1869, v. 2, p. 25, 14 cm., fig. 20.)

Answer to inquiry; description and figure of the gall of [*cynips*] *quercus-frondosa*.
B: P. M. (3575)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] The parasites of the human animal. (Amer. entom., Jan. 1869, v. 1, p. 84-88, 180 cm., fig. 73-74.)

General prevalence of parasites in nature; brief accounts of *pediculus humanus*, *p. cervicalis*, *p. pubis*, *oestrus hominis*, *pulex irritans*, *p. penetrans*, *acanthia lectularia*, *conorhinus sanguisuga* and *acarus scabiei*, and mention of some other articulates parasitic on humans; figures and habits of *reduvius personatus* (larva and imago), of Europe, and of *pirates biguttatus*; figure of *conorhinus sanguisuga*; classificatory relations of *pediculina* and *mallophaga*.
B: P. M. (3576)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] The periodical cicada. (Amer. entom., Dec. 1868, v. 1, p. 63-72, fig. 58-64.)

Extract, from p. 68, by authors, with same title. (*op. cit.*, June 1869, p. 202, 7 cm.)

Discovery of the existence of 13-year broods of *cicada*, and characterisation of these broods as a new species, *c. tredecim*; dimorphism of this species and of *c. septendecim*; seasons, habits, transformations, oviposition, enemies, diseases, ravages and sting of these species, and chronological statement of their several known broods.
B: P. M. (3577)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] Potato bugs. (Amer. entom., 1868, v. 1: Oct., p. 21-27, fig. 10-19: Nov., p. 41-49, fig. 33-48.)

Remarks on the usual failure of popular writers to distinguish between the several species of insects infesting the potato plant; brief accounts of *gortyna nitela*, *baridius trinotatus*, *sphinx quinquemaculata*, *epicauta vittata*, *macrobasis unicolor*, *m. murina*, *epicauta pensylvanica*, *e. marginata*, *lema trilineata* and *epitrix cucumeris*, treating of the geographical distribution, habits, food-plants and seasons of most of them, and giving figures of each in one or more states of growth; full account of *doryphora decemlineata*, its distinctness from *d. juncta*, its migrations, habits and enemies, and means against it; figures of *d. decemlineata* and *d. juncta* in their several states, and of numerous enemies of the former; habits of many of these enemies; inability of larva of *sphinx quinquemaculata* to sting; distinctness of *s. carolina* from this species; geographical distribution of *s. carolina*; characteristics of lepidoptera and coleoptera; vesicant properties of *lyttinae*; means against *lyttinae*; stercoracious larval protections; poisonousness of larvae of *doryphora decemlineata*; natural fluctuations in the abundance of insects.
B: P. M. (3578)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] The royal horned-caterpillar. *Ceratocampa* (*citheronia*) *regalis*, Fabr. (Amer. entom., Aug. 1869, v. 1, p. 230-231, 64 cm., pl. 1.)

Description of young and of full-grown larva and of pupa of *ceratocampa regalis*; figure of larva, pupa and imago; seasons, habits, food-plants, sexual differences, odor and vernacular names of this species; popular dread of it.
B: P. M. (3579)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] A swarm of butterflies. (Amer. entom., Oct. 1868, v. 1, p. 28-29, 34 cm., fig. 20-22.)

Record of flights of swarms of *danais archippus*; figures of lava, pupa and imago of this species; *asclepias* its foor-plant.
B: P. M. (3580)

upon occasion make good use of their wings, but probably fly only at night,

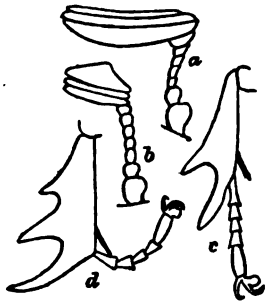

Fig. 13. *Hypotrichia spissipes* Lec. *a*, antenna of male; *b*, antenna of female; *c*, front tibia of male; *d*, ditto, female.

and are more subterranean in their habits than the males; this is indicated also by their form, which is heavier, more strongly built, and less pubescent than in the male. As this beetle has hitherto been known in the male sex only, I add a description of the female.[1]

Description of the female.—Color piceo-rufous, head and thorax darker; body shining, beneath sparsely pubescent, above very sparsely covered with short, stiff hairs; head small, convex, eyes small, scarcely visible from above; two basal joints of antennae enlarged, as in the male, the five following joints globular; club equal in length to the five preceding joints, with a conical prominence on its outer face; thorax rounded, convex, coarsely punctate; scutellum short, nearly triangular, not rounded behind; elytra shining, coarsely but obsoletely punctate, sutural stria well marked; pygidium much wider than long, finely and densely punctate.

The female is somewhat larger, more elongate and more convex than the male and is without the long and dense pubescence so conspicuous in that sex; the head, and especially the eyes are smaller; the thorax is larger, much more convex laterally and longitudinally, the base less lobed at middle, and is much less densely and more coarsely punctured; viewed from above the convexity of the sides conceals the true margin of the thorax which thus appears more regularly rounded than in the male. The five joints which constitute the scape of the antennae are well separated, and not connate as in the male, and the conical projection, which in the male appears upon the edge of the last joint, and gives to the antenna an irregular outline, is centrally placed in the female, and the club is regularly oval in outline.

The legs of the female are stouter, and project rigidly from the body, recalling the characteristic appearance of the *oryctini*, (*Oryctes*, *Aphonus*, etc.). The front legs are especially fossorial, the tibia being very broad, excavate within, and armed with three stout teeth on the outer edge. The male tibia is straighter and narrower, and has only two teeth.

The remarkable sexual differences in this species call to mind the still greater

[1] Leconte's original description of the male may be found in his "Classification of the coleoptera of North America .... pt. 1"(Smithsonian misc. coll., 1862 v. 3), p. 137.

ENTOMOLOGICAL ITEMS.

A NEW fungus has been found which is parasitic on *Drosophila nigricornis*. Prof. C: H. Peck has named the fungus *Appendicularia entomophila*.

MR. A. BALDING records, in *Nature* for 10 July 1884, the capture of dragon-flies (*Pyrrhosoma minium*), measuring about five centimetres in expanse of wing, by leaves of *Drosera rotundifolia*.

A BRIEF memoir of the late Dr. Hermann Müller of Lippstadt, has been written by Ernst Krause, the proceeds of the sale of which are to be added to the "Müller Fund." The brochure contains an excellent autotypic portrait of the deceased, and the memoir is accompanied by a chronological list of Müller's writings.—*Amer. naturalist*. Aug. 1884. v. 18. p. 848.

DR. F. BRAUER gives a brief notice of parts of the life history of *Hirmoneura obscura*, a dipteron, in the Verhandlungen der kaiserlich-königlichen zoologisch-botanischen gesellschaft in Wien, for 1883. The larva of this species lives in the grub and pupa of the European June-beetle, *Rhizotrogus solstitialis*.

AN EXCELLENT idea for publications of local scientific societies is carried out by the Verein für naturkunde zu Cassel, in its Bericht for 1883 to 1884. Over one-half of this Bericht is devoted to a list, by Dr. Carl Ackermann, of scientific works of all kinds pertaining to Cassel and its vicinity. In the portion of the list devoted to the distribution of animals is to be found mention of many papers upon the insect fauna of the above-mentioned region.

AT THE Montreal meeting of the British association for the advancement of science but one entomological paper was read. This paper, "A contribution to our knowledge of the *phytopti*," was by Prof. Playfair McMurrick, of Guelph, Ontario, Canada. Entomology was better represented at the Philadelphia meeting of the American association for the advancement of science. Dr. C. S. Minot read a paper "On the skin of insects"; Prof. Geo. Macloskie, on "The dynamics of the insect-crust"; Dr. C. V. Riley, "On the hitherto unknown mode of oviposition in the *carabidae*"; and Lillie J. Martin, a paper entitled, "A botanical study of the mite-gall found on the petiole of *Juglans nigra*, known as *Erineum anomalum* Schw.

AT A recent meeting of the Baltimore Naturalists' field club, Mr. Otto Lugger gave an account of a strange hymenopterous parasite infesting the larva of *Tiphia*. The *Tiphia* lays its eggs in the larva of *Lachnosterna fusca;* the larva of *Tiphia* when nearly mature eats the white grub and then spins for itself a beautiful silken cocoon. This larva in turn is often infested by the larva *Rhipiphorus pectinatus* or *R. limtatus*, the eggs of which have become fastened to the *Tiphia*, and in this way reach the *Tiphia* cocoon. Mr. Lugger has also found in the same cocoons small hymenopterous parasites. The order of events in this case appears to be that the larva of a large coleopterous insect is destroyed by a hymenopterous larva, this in turn by a coleopterous larva, and this again by a hymenopterous larva.—*Science record*, 15 Aug. 1884, v. 2, p. 232.

ACKNOWLEDGEMENT OF CONTRIBUTIONS.

THE CAMBRIDGE ENTOMOLOGICAL CLUB being so constituted that entomologists in all parts of North America may become active members thereof and acquire the same rights to control its affairs and direct its policy that are possessed by members resident in Cambridge, expects from North American entomologists a support as liberal as its constitution.

PSYCHE, being conducted under the direction of the Club, free from local or partisan interests, is likewise entitled to liberal support. Subscribers to PSYCHE may borrow from the library of the Club any works

which could be replaced in case of loss, upon compliance with the simplest conditions practicable. Thus subscribers who live at a distance from libraries may obtain, through the mails, the benefit of access to a valuable entomological library, constantly increasing by means of donations and the receipt of publications in exchange for PSYCHE.

A Permanent Publication Fund has been established by the Club, the income alone of which is used to assist in defraying the cost of the publication of PSYCHE. As yet the fund is too small to furnish the amount of income needed. The Club does not hesitate to ask the friends of entomology to contribute to this fund, believing that their favorite science will be benefitted thereby.

In default of a regular income sufficient to defray the cost of the publication of PSYCHE, reliance has had to be placed on the timely assistance of special friends of the work. As yet such friends have not been wanting, who have assisted by donations or the advancement of the money needed.

In March 1884 a statement of the financial condition of the Club for the year 1883 was sent to a large number of subscribers to PSYCHE, with a form of agreement for subscription to a guarantee fund for the payment of the deficit on the cost of publishing PSYCHE for 1883, as that deficit might stand on 1 July 1884. Bills were at the same time sent to all persons who were indebted to the Club, with a special request for payment of dues. The following persons agreed to pay the amounts set against their names, or so much *pro rata* as might be needed to meet the deficit:—

T: W. Higginson, Cambridge, Mass.	$5.00
H. Osborn, Ames, Iowa	5.00
W: H. Patton, Waterbury, Conn. .	5.00
F. G. Sanborn, Worcester, Mass. . .	5.00
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H: G. Hubbard, Crescent City, Fla. .	10.00
B: P. Mann, Washington, D. C. . .	25.00
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Mr. Sanborn having since died, but $60 were called for.

The financial condition of the Club, for 1883 stood as follows on 1 July 1884:—

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RECEIPTS.

From membership fees	$52.00
" subscriptions to PSYCHE . .	167.77
" publication fund (1880-1883) .	39.59
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Deficit	$125.35
Bills due	95.20

In contemplating this deficit it should be borne in mind that PSYCHE is sent in exchange to more than eighty societies or publishers, whose works enrich the library of the Club, and could be purchased only for a sum far in excess of the pecuniary deficit.

In the Annual reports of the Secretary, etc., for 1882, presented 12 Jan. 1883, and published in pamphlet form, are acknowledgments of donations to the Permanent Publication Fund, which, with other receipts, amounted to a principal of $224.39. Since then have been received from:—

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OCTOBER–DECEMBER 1884.

CONTENTS:

ADVERTISEMENTS 214
NOTES ON THE HABITS OF HYPOTRICHIA SPISSIPES LEC., WITH DESCRIPTION OF THE FEMALES—*Henry Guernsey Hubbard.* 215–217
DRINKING HABIT OF A MOTH 217
HEAD OF LARVAL MUSCA: PRELIMINARY NOTE—*George Macloskie* . . . 218–219
NOTES ON SOME COLEOPTERA TAKEN IN SOUTH LOUISIANA—*Charles Henry Tyler Townsend* 219–222
INDEX TO ENTOMOLOGICAL LITERATURE—*Benjamin Pickman Mann* . . 223
PARASITES OF THE LARVA OF LACHNOSTERNA FUSCA—*Charles Valentine Riley* . 224
FOOD-PLANTS OF PULVINARIA INNUMERABILIS—*Benjamin Pickman Mann* . . 224
PROCEEDINGS OF SOCIETIES—Cambridge Entomological Club . . . 224–226
BIBLIOGRAPHICAL RECORD, no. 3591-3674 227–232
ENTOMOLOGICAL ITEMS. 233–236

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PSYCHE.

NOTES ON THE HABITS OF *HYPOTRICHIA SPISSIPES* LEC., WITH DESCRIPTION OF THE FEMALES.

BY HENRY GUERNSEY HUBBARD, CRESCENT CITY, FLORIDA.

Several years ago I found in Florida a male specimen of this beetle, impaled upon a needle of the long-leaved pine (*Pinus australis*) which had fallen and lay upon the gound with its pointed end projecting upwards. The body was pierced through the back, between the scutellum and the hinge of the elytron. The wing-cases were spread widely open, as in the act of flight. Recently a second male, which is caught in a precisely similar manner, on the end of a broken grass culm, has been sent from Florida to the U. S. Department of agriculture. The beetle is so firmly fastened that the long journey from Florida has not shaken it from the spear of grass.

The repetition of this accident in the case of an insect of such rare occurrence that it is almost unknown in collections, suggested to me that the beetle might have a mode of flight very different from that of related may-beetles (*melolonthidae*). This surmise I have been able to verify in a manner that throws some light upon the habits of the beetle.

One day, last spring, during a light shower succeeding a long drought, while standing in an open place I became aware of an insect flying around me with great rapidity, and with a buzzing noise. Presently I distinguished a beetle which I at first mistook for an abnormally active individual of *Euphoria* (*Cetonia*) *inda*. It flew in circles, close to the earth, and seemed to be in search of something. Finally it made a sudden dart into the loose sand, and almost immediately disappeared beneath the surface. A considerable subterranean commotion, however, marked the spot, and I easily uncovered it at a depth of about five centimetres. It proved to be a male of *Hypotrichia spissipes*, and as I took in my hand, a second male, with which it had been locked in combat, disengaged itself and flew away. A female, which I fortunately secured, was immediately beneath the struggling males. It would seem, therefore, that *Hypotrichia* is not entirely crepuscular like its relatives the may-beetles (*Lachnosterna*), but that it also flies by day: at least in cloudy weather. Its flight resembles that of certain cetonians, which flit, hither and thither, keeping close to the ground. The latter, however, are abroad during the brightest noon-day sunshine. The body, especially in the males, is very thinly chitinized, and this, with its headlong flight, exposes it to such accidents as are recorded above. The females are exceedingly rare. They can

upon occasion make good use of their wings, but probably fly only at night,

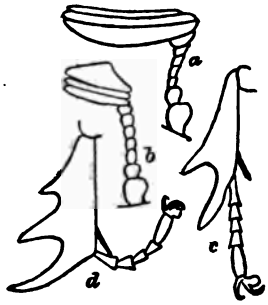

Fig. 13. *Hypotrichia spissipes* Lec. *a*, antenna of male; *b*, antenna of female; *c*, front tibia of male; *d*, ditto, female.

and are more subterranean in their habits than the males; this is indicated also by their form, which is heavier, more strongly built, and less pubescent than in the male. As this beetle has hitherto been known in the male sex only, I add a description of the female.[1]

Description of the female.—Color piceo-rufous, head and thorax darker; body shining, beneath sparsely pubescent, above very sparsely covered with short, stiff hairs; head small, convex, eyes small, scarcely visible from above; two basal joints of antennae enlarged, as in the male, the five following joints globular; club equal in length to the five preceding joints, with a conical prominence on its outer face; thorax rounded, convex, coarsely punctate; scutellum short, nearly triangular, not rounded behind; elytra shining, coarsely but obsoletely punctate, sutural stria well marked; pygidium much wider than long, finely and densely punctate.

The female is somewhat larger, more elongate and more convex than the male and is without the long and dense pubescence so conspicuous in that sex; the head, and especially the eyes are smaller; the thorax is larger, much more convex laterally and longitudinally, the base less lobed at middle, and is much less densely and more coarsely punctured; viewed from above the convexity of the sides conceals the true margin of the thorax which thus appears more regularly rounded than in the male. The five joints which constitute the scape of the antennae are well separated, and not connate as in the male, and the conical projection, which in the male appears upon the edge of the last joint, and gives to the antenna an irregular outline, is centrally placed in the female, and the club is regularly oval in outline.

The legs of the female are stouter, and project rigidly from the body, recalling the characteristic appearance of the *oryctini*, (*Oryctes*, *Aphonus*, etc.). The front legs are especially fossorial, the tibia being very broad, excavate within, and armed with three stout teeth on the outer edge. The male tibia is straighter and narrower, and has only two teeth.

The remarkable sexual differences in this species call to mind the still greater

[1] Leconte's original description of the male may be found in his "Classification of the coleoptera of North America . . . . pt. 1"(Smithsonian misc. coll., 1862 v. 3), p. 137.

dissimilarity of the sexes in *Pleocoma*, which genus has been placed by Leconte in the distant coprophagous series of Lamellicorns. Quite recently Gerstäcker has pointed out[2] the close relationship which exists between *Pleocoma* and the European genus *Pachypus*, the latter an undoubted melolonthian. The females in these genera resemble each other closely, and in both are without wings or wing-covers.

It seems probable that Leconte was somewhat misled by the determination of a larva described by Osten Sacken as that of *Pleocoma*.[3] This larva is supposed by Gerstäcker to belong to a lucanid beetle, but it may with greater probability be conjectured to be the larva of a *Geotrupes*.

Between the females of *Hypotrichia* and those of *Pleocoma* evidences of relationship are not wanting, and as both must now be considered members of the melolonthian series, a closer comparison than has yet been made will possibly bring the two genera into still more intimate relations. The series of genera, *Hypotrichia*, *Plectrodes* and *Pleocoma*, exhibits a very instructive passage from a winged insect with active powers of flight, as in the male of *Hypotrichia*, to the degraded, wingless, and wholly subterranean female of *Pleocoma*.

[2] Entom zeit . . . . Stettin, 1883, jahrg. 44, p. 436.
[3] Trans. amer. entom. soc., 1874, v. 5, p. 84.

DRINKING HABIT OF A MOTH.[1]—E. D. Jones describes a remarkable drinking habit of a yellow and black Brazilian moth (*Panthera* [corr.] *pardalaria*). He found these moths sitting on the wet stones in small streams near San Paulo, sucking up the water in a continuous stream, and letting it escape in drops from the abdomen. These drops fell at the average rate of 50 per minute, and as near as he could judge of their size, the total quantity of water which must thus pass through the body of the moth in three hours must be a cubic inch, or about 200 times the bulk of its own body. Mr. Jones speculates on the possible meaning of this and asks—"Can it be that the moth extracts nourishment from minute particles of organic matter contained in the water?" He remarks, however, that the water of the streams appear very clear and pure, and notes that the moths seems specially adapted for this habit. The tibiae of the hind legs are very thick, and are armed with long hairs, which by their capillary action prevent the moth being immersed in the water. "I have often," he adds, "seen one of them knocked down by a little spurt of water splashing over the stone on which it was standing, and it recovered itself almost immediately without being wetted in the least."—*Journ. roy. micros. soc.*, Oct. 1884, s. 2, v. 4, p. 741.

[1] Proc. lit. and phil. soc. Liverpool, 1883, v. 37, p. 76-77.

HEAD OF LARVAL MUSCA—PRELIMINARY NOTE.

BY GEORGE MACLOSKIE, PRINCETON, N. J.

The *muscidae* are usually said to have headless larvae. The real state of matters however is that their head is buried in their thorax, to be thrust out at will during larva-hood, or permanently in the adult. Some years ago I spent fruitless time in attempting to investigate this structure; but recent researches on the head and proboscis of the adult have enabled me to return to the attack with greater success. Mr. Walter M. Rankin has cut for me some excellent transverse sections of the head of the larva of *Musca caesar*, and by their help as well as by teasing I have got the following results.

1. The head has a double skeleton, the one independent of the other: (1) a large dark-colored case, figured by Weismann,[1] consisting of proximal, mid-, and distant parts, the distant part being the well-known "hooks" (really a bifurcated piece); (2) a chitinous armature lining the pharynx: outside of the pharynx-wall (therefore organically in the head) are muscles which join it to the larger, dark-colored case.

2. The dark-colored part represents the fulcrum, mid-segment, and the forked distal supports of the proboscis of the adult. The relation of parts is the same as in the adult: the salivary duct, made by the union of the ducts of the paired salivary glands, enters the mouth at the mid-proboscis as in the adult, and the longitudinal and transverse muscles are much as they shall always be.

3. The "hooks", or forked distal part, appear to be the precursors of the upper fork of the adult disti-proboscis: they have also inferior processes representing the inferior fork of the same. Perhaps these hooks are the mandibles.

4. The armature of the pharynx consists of a chitinous sheath lining its lumen. On the floor of this are eight longitudinal bars, which are found on cross-section to be hollow, each with a longitudinal slit opening towards the lumen of the pharynx.

5. On tracing the pharynx-armature to its anterior extremity we find that it terminates abruptly by a rim which supports a number of teeth at the roots of the longitudinal bars referred to. Here we have evidence that the longitudinal bars of the larva represent the pseudotracheae of the adult; they open by a long slit, and have transverse semi-rings so as to produce a resemblance to tracheae, all as in the pseudotracheae.

6. Hence the slit tubes which line the pharynx of the larva are identical with the pseudotracheae of the adult; and the swollen "labella" of the disti-proboscis of the adult are the everted stomodaeum, whilst its supporting forks are probably the mandibles.

7. The muscular apparatus for opening the pharynx is as in the adult. Long muscles descend from the walls of the

[1] Zeitschr. f. wiss zool., 1863-1860.

fulcrum to the roof of the pharynx, so as by their contraction to raise the roof, to enlarge the cavity, and to turn it into a forcing pump. When the pharynx is not so distended its roof is arched upwards and its lumen on cross-section merely a transverse slit. Above it—within the hollow of the arch—is a system of radiating muscles which increase the curvature of the pharynx-roof and so close it unless when antagonised by the descending muscles.

8. Except by the muscles, and at its inferior margin, the fulcrum has no organic connection with the pharynx. As the fulcrum transverses the length of the head, free externally of the outer wall of the head, and free internally of the proboscis which pierces it though separated from it, and as it is enclosed by muscles on both sides, it must be endoskeletal in its nature, *i. e.*, an ingrowth from the exoskeleton, like the endophragms of the thorax or the endocranium of the head of other insects.

12 Dec. 1884.

NOTES ON SOME COLEOPTERA TAKEN IN SOUTH LOUISIANA.

BY CHARLES HENRY TYLER TOWNSEND, CONSTANTINE, MICH.

The whole of Louisiana has been included by Leconte in the southern province of his great Atlantic district.[1] It would seem however, upon further consideration of the fauna, that the southern strip parallel with the coast should be connected with his "subtropical province, including the seacoast of Texas" (see map by Leconte); which, moreover, as he says, "belongs more properly to the eastern province of the tropical zoological district of Mexico."[2] It was in what might be called the subtropical province of the seacoast of Louisiana (being a continuation of the coast strip embraced in the eastern province of Mexico) that these notes were collected, and the observations here given made.

It will be borne in mind that at the time of my visit, 29 March to 21 June 1884, a large tract of country near Bayou la Fourche was overflowed from the great crevasse of March the same year. For the identification of most of the species to which these notes refer, I am indebted to the kindness of Dr. G: H: Horn.

The *cicindelidae* seemed to be nearly absent or of local occurrence in southern Louisiana, and not to frequent the low lands of that part of the state. I saw only two specimens of this family (one larva of *Tetracha carolina*, and one *Cicindela repanda*) in the latitude of New Orleans. Afterwards I saw *C. tortuosa* with *C. repanda* at the mouth of Red River. Though I visit-

[1] LECONTE, J: L. The coleoptera of Kansas and eastern New Mexico; with map showing the entomological provinces of North America. Wash., *Smithsonian institution*, 1859, p. iv.

[2] *Loc. cit.*, p. iii-iv.

ed Lake Pontchartrain several times in the first part of April, and also on 19 and 20 June, I could find no traces of *Cicindela* at all then, either on the beach or elsewhere. They are probably found here, however, at other times of the year. Not one was to be seen in the low country along Bayou la Fourche during April, May and June. Leaving New Orleans, and going up the river, I found them more plentiful in the higher country in the northern part of the state. They occur all along the river on the sand flats above the levee system and on the sandy mud-banks of the lower river.

Brachynus tormentarius is abundant under old wood in moist places. This is a much larger species than our northern bombardiers, and emits its explosions vigorously and with continued frequency, causing great pain unless carefully handled. Kirby and Spence state that they were informed by M. Lacordaire that the burning sensation arising from the discharges of the large exotic species was so painful that he had often been obliged to let those which he had taken escape.[3] This species may be among those to which M. Lacordaire had reference; it is certainly one of the "large exotic species." These beetles have a way of curling the tip of the abdomen up so as to eject the burning liquid not only behind and on each side but also frontwards over the back, and it is often expelled in drops, and to a considerable distance. The bombardiers all seemed, when a log was rolled over, to take the alarm from the one which first detected the danger and gave the signal by emitting its explosion; for all the others, wherever they might be, would follow with their explosions as soon as they heard that of one of their number. By this habit I often discovered individuals that had hidden in holes, or under leaves in the dirt.

In the flooded forest growths near Bayou la Fourche I found several of the ground-frequenting *carabidae* (*Chlaenius fuscicornis*, *C. laticollis* and others) under chips upon stumps that rose above the water. So this is how the carabs fared in their flooded home, taking to stumps and logs in default of the ground! Arboreal forms of these genera might be produced in this way, if inundation were to prevail for a sufficient length of time and the trees themselves continued to flourish in the water as well as before. Before the levee system was constructed the coleoptera as well as the other animals of southern Louisiana were undoubtedly accustomed to the periodical inundations caused by the risings of the Mississippi forcing them to seek habitation elsewhere than on the ground. The ground-frequenting species that survived probably then took to stumps and logs, as in the present instance; while others confined themselves to the foliage or bark of the trees, which previously had been frequented by them only a portion of the time. And thus they lived until the waters subsided and allowed them to betake themselves to their old retreats. Perhaps this ac-

[3] Kirby and Spence's Entomology, 7th ed., p. 419.

counts for the scarcity of the *cicindelidae*, and the absence of *Calosoma* (not a specimen of which could be found) in that part of the state. I might add in this connection that I also took a pair of *Eudocimus mannerheimii*, besides some *cerambycidae* (*Leptura abdominalis*) and some other coleoptera all on one stump a good distance out in the flooded forest.

Not a specimen of the *silphidae* was taken; this is undoubtedly owing to the great numbers of buzzards, which effectually clean up every thing in the shape of carrion.

I noticed that specimens of *Dicerca obscura*, instead of taking immediate flight when alarmed, loosed their hold from the plants (wormwood [*Artemisia*] and ragweed [*Ambrosia*]) to which they were clinging, and dropped to the ground like weevils; which is a far more inactive mode of escape than that employed by some others of this family, for example *Chrysobothris femorata*.

Chauliognathus marginatus, which is very abundant upon patches of blossom in the South, seems to prefer yellow flowers, as its color assimilates better with the yellow; and upon these it is generally found. Though it is sometimes found upon white daisies, the stigmata of these are yellow, and help to blend the color of the insect with that of the flower. I noticed on 17 April that many of these insects were infested with a little red mite.

I took a specimen of *Neoclytus erythrocephalus* on a tuft of the common ragweed [*Ambrosia artemisiaefolia*], 18 May. Clinging in the green foliage of the weed, this cerambycid, with the four bright yellow transverse markings of its elytra continuing clear around the body, resembled exactly *at first sight* a species of hornet or wasp which has the abdomen encircled with yellow bands, so that I hesitated a moment before capturing it. Its slender and cylindrical form and long legs so like a wasp's combine with the bright yellow bands to make up a deception calculated to imbue more animals than one with the dread of a concealed sting ready to prove effective should they have the audacity to meddle with it.

I noted an interesting fact relating to sexual selection in *Desmocerus palliatus*. These beetles are quite abundant on the elder leaves [*Sambucus*] in April, at this time pairing. On 22 April I noticed a very brightly colored pair in coitu upon a leaf, and on another leaf right by them an individual which had the orange bases of the elytra not nearly so bright or deeply colored as usual, but looking faded. On 27 April I observed a similar instance of a brightly colored pair with a dull colored, lone individual near by. This shows that the dull-colored individuals do not stand much chance of pairing, but that the bright ones select each other. Dull ones are not very common, and are probably of chance occurrence. I noticed that this species was much more plentiful on the leaves on cold and cloudy days than on warm and bright ones.

One morning, going by a wood-pile, I heard something suddenly drop from above and strike on one of the lower

sticks of wood. Supposing it to be a beetle, I looked carefully and found a specimen of *Acanthoderes quadrigibbus*, apparently lifeless, but lively enough as soon as I picked it up.

This species almost invariably drops when approached. In color it assimilates so well with the whitened boards, or other old, weathered pieces of wood to which it may be clinging, that it is often difficult to detect it. The habit of dropping and remaining perfectly motionless for a short time has been acquired by many coleoptera as a means of escape from some of their many enemies. But in this instance the beetle, instead of escaping, drew my attention right upon it by this habit.

When *Mecas inornata* sees any one approaching towards it, at some distance, it generally takes wing and flies a long ways; but if one is very near and about to capture a specimen it usually drops and feigns death.

Plagiodera scripta was abundant in all stages on some cottonwood or poplar sprouts [*Populus monilifera*] along a ditch on a plantation. The editors of the *American entomologist* have illustrated several variations in the elytral markings of this species.[4] But of the forty-three specimens taken by me in Louisiana every one is of the normal form. I did not notice that the species injured any planted cottonwoods here at this time.

On stems of elder [*Sambucus*] (also taken on young poplar or cottonwood sprouts) the little black *Chalcodermus aeneus* was quite abundant. These hard, finely punctured, chunky little weevils take up their positions at the joints of the elder stalks, and thus easily pass for leaf-buds just appearing, and still enveloped in their dark red (nearly black) outer coverings. This is a very interesting and effective deception.

I took thirty-six specimens of *Rhodobaenus 13-punctatus*. These show considerable variation in the elytral markings. Twenty-three have the thirteen spots more or less clearly defined; eleven have the two posterior and inner-medial spots united in one marking extending over both elytra; one has the two posterior, inner-medial and anterior spots united in one large marking, leaving only the outer-medial on each elytron in its normal form, and having the middle and two posterior prothoracic spots united, leaving the shield three-marked; and one is well defined, 11-punctate, having none of the spots united, but with the two outer-medial entirely wanting.

One day I noticed an individual of this species upon a plant that had been overrun by a party of ants. The weevil was running up and down trying to escape from its hymenopterous enemies, which kept running over it and attacking it. All the while it gave forth an agreeable scent very similar to peppermint; agreeable to me, but perhaps not to the ants, to repel whom it might have been intended. The scent did not seem to arrest the progress of the ants in the least, and the "sheath-wing" would probably have succumbed to the "vein-wings" in the end, had I not rescued the former for my collecting bottle.

[4] American entomologist, 1880, v. 3, p. 160.

PSYCHE.

CAMBRIDGE, MASS., OCT.-DEC. 1884.

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INDEX TO ENTOMOLOGICAL LITERATURE.

The time consumed by special students in searching through a whole literature for those portions of it which bear upon their special studies is largely wasted. The literature of special subjects is so scattered, and that of different subjects so intermingled, that each student who tries to find for himself what relates to the subjects he is studying is obliged to peruse a great deal of literature that is not of service to him, far more, indeed, than that which he can use, in proportion as the subjects he is studying form but a fraction of all the subjects treated in the literature. Here, as in other fields of labor, specialization carries with it economy and efficiency. The diligent worker who, laboring to that end, by comprehensive methods forms an index to all the special subjects treated in the literature as he examines it finds himself at last able to refer without hesitancy or waste of time to all the literature which treats of any of these specialties. He is then in a position to supply the needs of the specialists first mentioned. While but few persons are interested in these references as a whole, each specialist finds the portion referring to his own field of study of great value. Having accumulated an immense stock of references to the literature of entomology, I will furnish references on special subjects at ten cents each reference, or fifty cents per decade. The system upon which these references will be furnished is the following. The person seeking references shall send me his list of references already obtained; the references I furnish will then only be those additional to this list, so that no one will have to pay for that which he already has. If any person finds the transcription of the references which he already has not worth the saving of the cost under this rule, he can not complain of the cost of the references furnished him. Extracts from and translations of portions of literature on desired subjects will also be procured on demand.

The publication of bibliographical records in the pages of PSYCHE and other works and the indexing of these records place a considerable number of references at the disposal of specialists without special payment therefor. So rapidly as means admit these records and indices in PSYCHE will be enlarged. Meanwhile the pages of PSYCHE stand open for contributions from the stores of specialists who have already gathered for their own use references to the literature of their specialties. When it is considered with how great labor these lists of references are gathered, and how one student after another is obliged to perform this labor anew, for want of the publication of lists once made, it may be seen of how great service to the public would be the publication of these lists. The very persons who may be disposed to depreciate the value of general indexes such as mine, for the reason that they in their special fields have fuller indexes or those most complete to date, are the ones who may render the greatest service to their fellow-workers by publishing their lists.

B: PICKMAN MANN.

Washington, D. C., Nov. 1884.

PARASITES OF THE LARVA OF LACHNOSTERNA FUSCA. In an item quoted in PSYCHE, v. 4, p. 211, from *Science record*, Mr. Otto Lugger is reported as saying that "*Tiphia* lays its eggs in the larva of *Lachnosterna fusca*," and the larva "when nearly mature eats the white grub." Further, that the eggs of *Rhipiphorus*, a secondary parasite, "become fastened to the *Tiphia*." These statements are not strictly accurate. The conjecture in my 6th Missouri report,[1] p. 123-126, that the *Tiphia* larva preys externally on that of *Lachnosterna*, I have since verified, and of course it begins feeding as soon as hatched; while it would be quite exceptional for *Rhipiphorus* to lay its eggs on *Tiphia*. The probability, as stated in the report cited, is that the eggs are deposited on flowers frequented by *Tiphia*, to which the triungulin fastens and by which it is carried into the ground. It would be interesting to know whether Mr. Lugger speaks from observation or conjecture.—C. V. RILEY, *at meeting of Entomological society of Washington, 6 Nov. 1884.*

FOOD-PLANTS OF PULVINARIA INNUMERABILIS. On p. 338 of J. D. Putnam's "Biological and other notes on *coccidae*" [Psyche, Rec., no. 1989], it is stated that Mr. Putnam has observed *Pulvinaria innumerabilis* in great abundance on *Acer dasycarpum*, *A. saccharinum*, *Negundo aceroides* and *Tilia europaea*, on each of which it thrives well, best on the *Negundo*, but least on *A. saccharinum*. Mr. Putnam knew personally of the occurrence of this species also on *Robinia pseudacacia*, *Vitis labrusca* and *Rhus glabra*, in the vicinity of infested maples. In one instance he found a single undersized specimen, with its "nest," on *Vitis riparia*, more than 800 metres from the nearest infested *Acer*. He adds *Rosa* and *Fagus* to the list of food-plants, on the authority of S. S. Rathvon, who found it once on each of these plants, and mentions with doubtful credence the opinions of Emily A. Smith and C. V. Riley that they had also found it on *Salix*, *Maclura*, *Quercus*, *Ulmus*, *Platanus*, *Ribes*, *Euonymus* and *Celtis*. It undoubtedly occurs in very great abundance on *Maclura* hedges in Washington, D. C., as I have observed. On the 30th of June this year (1884) I received from F. R. Rathbun, of Auburn, N. Y., three twigs of *Ulmus*, gathered on the 28th, in Auburn, bearing respectively 1, 1 and 3 specimens of mature *Pulvinaria innumerabilis*, with fully developed nests, from which the larvae have since hatched in great numbers. These all came from one tree. In sending specimens previously, Mr. Rathbun wrote that "the maples [*Acer*] especially have the silky pussys or cocoons to a large extent, and they are invariably found on the under sides of the twigs. Sometimes they are arranged thickly, in rows, and again singly." Mr. Putnam says "there is enough evidence to show that this insect is capable of thriving on quite a variety of food-plants, and in the cases where it has been directly introduced from the maple there is no question of its identity." The specimens referred to in this communication will be deposited in the Museum of comparative zoology at Cambridge, Mass., where they are more certain of good care and of being accessible to students than in any other collection of national extent in the country.—B: PICKMAN MANN *at meeting of Cambridge entomological club, 10 Oct. 1884.*

[1] PSYCHE, Rec., no. 39.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

(*Continued from p. 180.*)

14 MAR. 1884.—The 100th meeting of the club was held at 61 Sacramento St., Cambridge, 14 Mar. 1884, the president, Mr. S: H. Scudder, in the chair.

The secretary announced the withdrawal from the club of Mr. Henry Savage, of Boston, Mass.

Mr. S: H. Scudder showed fossil specimens and figures of *Anthracomartus*, to illustrate the remarks which he had made at the last meeting.

Dr. G: Dimmock showed samples of the different grades of Central American cochineal, carmin of commerce, carminic acid and some of its salts.

Mr. S: H. Scudder exhibited some lithographic work and wood-cuts for comparison of methods of depicting fossil insects.

Mr. S: H. Scudder reviewed Part 1 of A. E. Eaton's "A revisional monograph of recent *ephemeridae*" (Trans. Linn. soc. Lond., Zool., s. 2, v. 3, p. 1-77, pl. 1-24).

11 APRIL 1884.—The 101st meeting was held at 61 Sacramento St., Cambridge, 11 April 1884. In the absence of the president, Mr. T. W: Harris was chosen chairman.

Mr. H. Hinkley showed several insects, among them a larva, probably that of *Eucronia maia*.

Dr. G: Dimmock showed specimens of several curious insects. Among them was a *Culex* with a parasitic nematod (*? Gordius*) dissected from its abdomen. The specimen was taken near Leipzig, Germany. The parasite was very large, relatively to the size of the *Culex*. No parasitic worms had been previously recorded from *Culex*, except *Filaria sanguinis-hominis*, altho *Mermis* had been found in *Simulium reptans*, in *Tanypus nebulosus* and in a species of *Chironomus*, and *Gordius* had been taken from *Chironomus plumosus*.

9 MAY 1884. — The 102nd meeting was held at 19 Brattle St., Cambridge, 9 May 1884, the president, Mr. S: H. Scudder, in the chair.

The secretary announced that Dr. C: E. Webster had removed his residence to Chicago, Ill., and had sent notice of withdrawal from membership in the club, to take effect at end of 1884. The secretary read a statement, from the treasurer, of the financial condition of the club on 1 May 1884.

Mr. S: H. Scudder made some remarks concerning the late Dr. J: L. LeConte, who was an associate member of the club.

Dr. G: Dimmock mentioned certain habits of *Corixa* and *Notonecta*, a fuller account of which will be published later.

13 JUNE 1884.—The 103rd meeting of the club was held at 19 Brattle St., Cambridge, 13 June 1884, the president, Mr. S. H: Scudder in the chair.

The secretary announced the death of Mr. Francis Gregory Sanborn, an associate member of the club, who died 4 June 1884, at Providence, R. I. Mr. Sanborn was born 18 Jan. 1838, at Andover, Mass.

Mr. S: H. Scudder showed a portrait of the late Dr. J: L. LeConte.

Mr. S: H. Scudder gave the results of his studies upon the "Arachnidae of paleozoic formations." Numerous figures and specimens of fossils were shown. [*See* Proc. Amer. acad. arts and sci., 1884, v. 20, p. 13-22.]

Dr. G: Dimmock explained an apparatus by which he was enabled to rear insects in gases of different kinds or in determinate proportions of gases and air.

Dr. G: Dimmock described the way in which the red mites that were so abundant about Cambridge this year produced the fine, light colored lines upon leaves of clover, grass and other plants. Leaves which had been marked by these mites were shown.

Mr. R. Hayward stated that an *Onthophagus* which he had for some time supposed to be a new American species proved to be *O. luteicornis* from Europe.

10 OCT. 1884.—The 104th meeting was held at 61 Sacramento St., Cambridge, 10 Oct. 1884. The meeting was called to order at 8 p. m. In the absence of the president, Mr. R. Hayward was chosen chairman.

The secretary announced the withdrawal from the club of Mr. F. C. Bowditch, of Brookline, Mass.

Dr. H. A. Hagen made some inquiries in regard to the condition and accessibility of the library of the Club, and offered some

suggestions in regard to its management. After considerable discussion it was decided to refer the matter to the Executive committee.

Mr. B: P. Mann presented (through the secretary) a communication upon "Food-plants of *Pulvinaria innumerabilis*." [Printed in *Psyche*, Oct.-Dec. 1884, v. 4, p. 224.]

Dr. G: Dimmock showed a large larva of some species of *oestridae* (? *Cuterebra emasculator*), which had been sent to him by Mr. Leroy H. Sykes, of Suffield, Conn. This larva was taken by Mr. Sykes, about 20 Sept. 1884, from beneath the skin of a chip-squirrel (*Tamias striatus*) just at the right of the median ventral line near the umbilicus. Mr. Sykes thinks the squirrel was a castrated male.

Dr. H. A. Hagen commented upon and read some notes from a manuscript journal of Christoph Zimmermann, chiefly concerning the coleopterist Dr. F. E. Melsheimer and his relatives. Zimmermann, who came to Philadelphia in 1832, later visited Melsheimer at his home in Hanover, Pa., and describes his visit. [See *Canadian entomologist*. Oct. 1884, v. 16, p. 191-197.]

14 Nov. 1884.—The 105th meeting was held at 19 Brattle St., Cambridge, 14 Nov. 1884, the president, Mr. S: H. Scudder in the chair.

The secretary gave notice of the withdrawal from the club of Prof. E. L. Mark, of Cambridge, Mass.

Dr. H. A. Hagen alluded to some interesting points in the histology of the rectal muscles of a lepidopterous larva, recently brought to light by Rev. F. T. Hazlewood, of Lynn, Mass.

Mr. S: H. Scudder exhibited a piece of leather-like fabric produced by the larvae of some species of Mexican lepidoptera; and also showed seed-capsules of a species of *Pelargonium*, which were perforated by some insect in escaping from them.

Mr. S: H. Scudder exhibited a specimen of a carboniferous arachnid (*Geralinura carbonaria*) recently discovered at Mazon Creek, Illinois, which was of interest because it was the first recorded instance of a fossil of the order to which it belongs,—the *pedipalpi*. It was described in June last in the Proceedings of the American academy of arts and sciences. Curiously enough, only nine days later, another species of the same genus, from Rakowitz, Bohemia, was described by Kusta under the name *Thelyphonus bohemicus*, in a paper in the Transactions of the Bohemian academy, which has just reached this country. This adds still another to the already frequent instances of the occurrence of the same generic type of arthropods in the carboniferous deposits of Europe and America.

Dr. H. A. Hagen made some remarks in regard to swarming of *Atropos divinatorius* in houses.

12 Dec. 1884.—The 106th meeting was held at 19 Brattle St., Cambridge, 12 Dec. 1884, the president, Mr. S: H. Scudder in the chair.

Mr. S: H. Scudder made some remarks upon a fossil beetle from Ontario, Canada, and upon a fossil scorpion from the silurian. This scorpion had been mentioned by Linström in a letter to a friend in this country, and an extended notice of it will be prepared in conjunction with Thorell. This discovery is important, as it places the origin of the *arachnoidea* back in the silurian, and because of its showing further peculiar characters which may ally it to the *merostomata*.

Dr. G: Dimmock showed pieces of the excrement of the larva of *Sphinx drupiferarum*, which are often of excessive length in proportion to their diameter, in comparison with the excrement of other *sphingidae*. This prolongation of the excrement of the larva of this species is coordinate with a prolongation of the part of the larva behind the "caudal horn." Dr. Dimmock also exhibited excrement of an undetermined larva which feeds on *Pinus strobus;* the excrement consisted of pieces, each made up of three spheroids arranged in a straight line.

Mr. S: H. Scudder reviewed a paper on fossil insects, mostly cockroaches, published by Moritz Kliver, in *Palaeontographica* for 1883, under the title "Ueber einige neue blattinarien-, zwei dictyoneura- und zwei arthropleura-arten aus der Saarbrucker steinkohlenformation."

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard: S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Anderson, T. J. The paucity of neuropterists. (Entomologist, May 1882, v. 15, p. 117-118.)

Some reasons why there are so few students of neuroptera. *G: D.* (3591)

Andrews, W: Valentine. The cynthia silkworm. (Amer. nat., Aug. 1868, v. 2, p. 311-320.)

Discusses the insects which have been mentioned or figured as [*attacus*] *cynthia*, and says, "the insect I am writing about is the one figured, tolerably well, in Duncan's Exotic moths, Plate 14, fig. 1." Describes briefly the egg, four larval stages, and cocoon of this species, which feeds on ailanthus, and discusses its value in sericulture. *G: D.* (3592)

Andrews, W: Valentine. Ravages of the *alypia octomaculata*. (Amer. nat., Feb. 1869, v. 2, p. 666-667.)

Reprint, with slight omissions, in C: V. Riley's "Insects injurious to the grape-vine. No. 6" (Amer. entom., Mch. 1870, v. 2), p. 151-152.

Notice of a grape-vine in New York city from which the leaves were entirely stripped by larvae of *alypia octomaculata*. *G: D.* (3593)

Annual meeting of the Entomological club of the American association for the advancement of science. (Can. entom., 1878, v. 10: Sep. [Oct.], p. 170-178; Oct. [Nov.], p. 190-192.) [Rec., 1348.]

Minutes of the meetings of the Entomological club of A. A. A. S., held 20-21 Aug. 1878, at St. Louis, Mo.; annual address of the president [J. A. Lintner]; proposal of amendment of constitution; election of officers; communications and discussions.

Contents further analyzed under following captions: —ENTOMOLOGICAL CLUB [etc.]. — *President, 1878.* Annual address [Rec., 3650]. — GROTE, A: R. *and* WETHERBY, A. G. [Exhibition of moths, and on the number of broods of certain bombycid moths] [Rec., 3659]. — SMITH, Emily A., *et al.* [On the life history of *Icaniium acericorticis*, and on means of destroying this and similar insects] [Rec., 3670]. — RILEY, C: V. [Abstracts of some papers proposed to be read to the association] [Rec., 3667].—LINTNER, J. A., *et al.* [On the collecting of noctuid moths by "sugaring," and on devices for collecting] [Rec., 3663]. — SMITH, Emily A. [Damage done to oaks by *argyrolepia quercifoliana*] [Rec., 3669]. — [On instinct or reason displayed by insects] [Rec., 3662]. *B: P. M.* (3594)

Anthony, A: Cox. *Hydrophilus triangularis* at Swampscott, Mass. (Journ. Bost. zoöl. soc., April 1882, v. 1, p. 26.)

Records the capture of *hydrophilus triangularis* at Swampscott, Mass. *R. H.* (3595)

Anthony, A: Cox. New England *philampeli*. (Journ. Bost. zool. soc., April 1882, v. 1, p. 18-19.)

Gives a brief account of the life-history of species of *philampelus*. *R. H.* (3596)

Arnhart, Ludwig. [Ein secundärer sexualcharakter von *acherontia atropos*.] (Verhandl. k.-k. zool.-bot. gesells. in Wien, 1879, bd. 29; Sitz.-ber., p. 54-55, fig.)

Describes and figures an evaginable organ, of doubtful function, at the sides of the first two abdominal segments of the male of *acherontia atropos*. *G: D.* (3597)

Ashmead, W: Harris. *Antigaster mirabilis* in Florida. (Amer. entom., June 1880, v. 3, n. s., v. 1, p. 152, 5 cm.)

Antigaster mirabilis raised from eggs of *microcentrum retinerve* in Florida; comparison of *aphelinus* sp. with figure of *a. mytilaspidis*. *B: P. M.* (3598)

Ashmead, W: Harris. Mite preying on orange scale. (Amer. entom., Apr. 1880, v. 3, n. s., v. 1, p. 106-107, 13 cm.)

Description of eggs, immature stages and habits of *tyroglyphus gloverii*, which preys upon *coccidae* on leaves of *citrus*. *B: P. M.* (3599)

Ashmead, W: Harris. On the red or circular scale of the orange, *chrysomphalus ficus* Riley ms. (Amer. entom., Nov. 1880, v. 3, n. s., v. 1, p. 267-269, 67 cm., fig. 146.)

Rev. [by C: V. Riley], entitled "New species of scale insects." (*op. cit.*, p. 275-276, 12 cm.)

Superficial descriptions of egg, larva, and female scale of *chrysomphalus ficus*, with references to the literature, remarks on the first appearance of this insect in Florida, on its probable origin and spread, its foodplants, and natural history, and means against it; figure of infested leaf of *citrus*. *B: P. M.* (3600)

Austin, E: Payson. Collecting *stylopidae*. (Journ. Bost. zool. soc., April 1882, v. 1, p. 12-13.)

Describes a day's collecting of *stylopidae*, at Readville, Mass. The males of *xenos* far outnumber the females. *R. H.* (3601)

Austin, E: Payson. Notes on collecting certain *buprestidae*. (Journ. Bost. zool. soc., Oct. 1882, v. 1, p. 45-46.)

Habitats of and modes of collecting *buprestidae*. *G: D.* (3602)

Austin, E: Payson. [Use of air-bubbles carried by water-beetles.] (Can. entom., Sep. 1879, v. 11, p. 176.)

Reply to an inquiry by J: G. Morris as to the purpose served by the globule of air which certain water-beetles carry with them when they dive; method of retention of this bubble; its gradual disappearance supposed to be due to its inhalation by the insect. *B: P. M.* (3603)

Austin, *Mrs.* R. M. *Darlingtonia californica*, Torr. (Bot. gazette, Aug. 1878, v. 3, p. 70-71, 6 cm.)

Notes the presence of large numbers of carnivorous larvae in the pitchers of *darlingtoria californica*, both in summer and winter. *W: T.* (3604)

Bacon, W. D. Season of 1816. (Memoirs Phil. soc. promot. agric., 1818, v. 4, p. 219.)

Means against *cecidomyia destructor*. *B: P. M.* (3605)

Bailey, James Spencer. [Noctuid moths coming to sugar and decomposing animal matter.] (Can. entom., Nov. 1879, v. 11, p. 203-204.)

Reply to inquiry by A: R. Grote whether *cucullia* ever comes to "sugar"; capture of *cucullia* and *plusia* "at sugar"; noctuid moths found feeding on decomposing animal matter, especially on partially decomposed deer hides. *B: P. M.* (3606)

Balding, G: On the urticating properties of the hairs of *liparis chrysorrhea*. (Entomologist, Nov. 1884, v. 17, p. 256-257.)

Describes poisonous effects of hairs of chrysalis of *liparis chrysorrhea* on the skin. *G: D.* (3607)

Barbier, Fr. Éducation des larves de dytiscides. (Feuille des jeunes naturalistes, June 1883, an. 13, p. 103.)

Mode of rearing larvae of *dytiscidae*. *G: D.* (3608)

Barbour, James. Cultivation of wheat. (Amer. farm., 17 Dec. 1819, v. 1, ed. 3, p. 301-302, 84 cm.)

"The two principal enemies to wheat are the hessian fly and the smut;" discussion of these; hessian fly [*cecidomyia destructor*] first appeared in this locality in 1798; "Lawler" wheat is proof against it. *B: P. M.* (3609)

Bargagli, Piero. Note intorno alla biologia di alcuni coleotteri. (Bull. soc. entom. ital., 1884, anno 16, p. 92-96.)

Ptinus fur obtained from the nest of *vespa crabro*; notes on other beetles belonging solely to the European fauna. *G: D.* (3610)

Barlow, T: *Atropos pulsatorius*. (Amer. journ. agric. and sci., Oct. 1847, v. 6, p. 195-196.)

Direct testimony that *atropos pulsatorius* makes a tapping noise. *B: P. M.* (3611)

Barnard, W: Stebbins. *Bucculatrix* cocoons. (Amer. entom., Mch. 1880, v. 3, n. s., v. 1, p. 76, 7 cm.)

Letter from "W. S. B.," with note [by C: V. Riley]; hibernation of *bucculatrix pomifoliella*; situations in which its cocoons are spun. *B: P. M.* (3612)

Barnard, W: Stebbins. *Campodea fragilis* Meinert. (Amer. entom., Aug. 1880, v. 3, n. s., v. 1, p. 199, 22 cm., fig. 104-105.)

Occurence of *campodea fragilis* and *degeeria lanuginosa* at Ithaca, N. Y.; food-habits and systematic position of the former; figures of both species. *B: P. M.* (3613)

Barnard, W: Stebbins. The cotton worm, (Our continent, 22 Mch. 1882, v. 1, p. 93. 116 cm., 1 fig.)

Importance of the ravages of *aletia argillacea* and difficulty of preventing them; habits of the larva and of its parasites, especially of *tachina aletiae*; course of transformations of the *aletia*; figures of larva, pupa and imago and of injured cotton plant; habits and migrations of the imago of the *aletia*; improvements in devices for the application of poisons to the plants. *B: P. M.* (3614)

Barnard, W: Stebbins. Dominican casebearer. (Amer. entom., Sep. 1880, v. 3, n. s., v. 1, p. 227, 9 cm., fig. 118)

Food-habits of *coscinoptera dominicana*; figures of eggs, larva, imago, larva-case and anatomical details of this species. *B: P. M.* (3615)

Barnard, W: Stebbins. European tussock-moth. (Amer. entom., Mch. 1880, v. 3, n. s., v. 1, p. 77, 8 cm.)

Ravages of *orgyia antiqua* and of "canker worms" at Ithaca, N. Y., in 1879; description of egg-mass of the *orgyia*; no cocoons of males discovered. *B: P. M.* (3616)

Barnard, W: Stebbins. [Habits of *phymata erosa*.] (Can. entom., Oct. 1879, v. 11, p. 196.)

Carnivorous propensities of *phymata erosa*; *pieris rapae* killed by it; habitation of the insect. *B: P. M.* (3617)

Barnard, W: Stebbins. Notes on the development of a black-fly, *simulium*, common in the rapids around Ithaca, N. Y. (Amer. entom., Aug. 1880, v. 3, n. s., v. 1, p. 191-193, 94 cm., fig. 103.)

Description of eggs, larva, pupa and imago of *simulium* sp.; figures of eggs; habits of larvae of this species and of imagos of the genus; method of raising larvae of this species in confinement. *B: P. M.* (3618)

Barnard, W: Stebbins. Parasitic rove-beetle: *aleochara anthomyiae*, Sprague. (Amer. entom., Aug. 1880, v. 3, n. s., v. 1, p. 199-200, 13 cm.)

Occurrence and habits of a beetle alleged to be *aleochara anthomyiae*, at Ithaca, N. Y. *B: P. M.* (3619)

Barnard, W: Stebbins. Parthenogenesis in *orgyia antiqua*. (Amer. entom., Sep. 1880, v. 3, n. s., v. 1, p. 227, 6 cm.)

Statement of conclusions drawn from finding many cocoons of the female and none of the male of *orgyia antiqua* in winter and spring; this species believed to have no enemies, to be perfectly fitted to withstand the climate [at Ithaca, N. Y.], and to reproduce parthenogenetically. *B: P. M.* (3620)

Barrett, C: Golding. Notes on British *pterophoridae*. (Entom. mo. mag., Jan. 1882, v. 18, p. 177-180.)

Includes notes upon *platyptila bertrami* and *pterophorus monodactylus*, both American species. *G: D.* (3621)

Bassett, Homer Franklin. Arrangement of N. A. *cynipidae* by Dr. Mayr. (Amer. nat., Apr. [22 Mch.] 1882, v. 16, p. 329-330.) (RILEY, C: V. Entomology . . . [Apr. 1882], p. 329-330.)

Review of [author's] "List of North American *cynipidae*" (*op. cit.*, Mch. [24 Feb.] 1882, p. 246) [Rec., 3356]; Mayr enumerates in his list probably less than half the North American species of *cynipidae;* geographical distribution of the genera mentioned; note [by C: V. Riley] on the value of this list, which will replace, so far as it embraces the North American species, that given in C: R. Osten Sacken's "Contributions to the natural history of the *cynipidae* of the United States . . . Article 4th" (Proc. entom. soc. Philad., May 1865, v. 4) p. 379-380. *B: P. M.* (3622)

Bassett, Homer Franklin. [Former injuries by *pissodes strobi* at Waterbury, Conn.] (Can. entom., Sep. 1879, v. 11, p. 176-177.)

Pinus strobus greatly injured by *pissodes strobi* at Waterbury, Conn., from 1864 to 1869, but very little since. *B: P. M.* (3623)

Bates, H: Walter. Contributions to an insect fauna of the Amazon valley. Lepidoptera: *heliconidae*. (Trans. Linn. soc. Lond., 1862, v. 23, p. 495-566, pl. 55-56.)

Extr. [from p. 509], entitled, "Mimetic forms among insects." (Amer. nat., May 1867, v. 1, p. 155-156.)

Classification, relationship, systematic position, and habits of species of *heliconidae;* discusses mimicry and its causes in these and other insects; freedom of the *heliconidae* from attack on account of their odor given as a reason why they are mimicked by other insects; discusses reasons for mimicry between species of *heliconidae* themselves; notes on the species of *heliconidae* of the Amazon valley; describes the new genera *callithomia*, *napeogenes*, and *melinaea* (of the *heliconidae*), and *ithomeis* (of the *erycinidae*). *G: D.* (3624)

Beling, Theodor. Beitrag zur biologie einiger käfer aus den familien *dascyllidae* und *parnidae*. (Verhandl. k.-k. zool.-bot. gesells. in Wien, 1882, bd. 32; Abh., p. 435-442.)

Describes larva and pupa of *elodes coarctatus*, *e. serricornis*, *pomatinus substriatus*, and *parnus auriculatus;* and pupa of *elmis volkmari* and *e. aeneus*. *G: D.* (3625)

Berg, Cárlos. Analecta lepidopterologica. Contribuciones al estudio de la fauna de la República Argentina y otros países americanos. (Anales Soc. cient. argent., 1882, v. 14, p. 275-288.)

Separate, Buenos Aires, 1882. t.-p. cover, 16 p. [t.-p., p. 275-288], 25 × 16, t 18.5 × 10.5.

Synonymical and other notes on species of *heterocera;* describes 7 new species, viz.: *oeceticus platensis*, *mimallo cordubensis*, *chloridea molochitina*, *acontia venusta*, *erastria nubila*, *trothisa (thalpochares) margaritae*, and *plusia bonaerensis*, all from South America. Some species of North American *noctuidae* are noted from South America. *G: D.* (3626)

Berg, Cárlos. Miscellanea lepidopterologica. Contribuciones al estudio de la fauna argentina y países limítrofes. (Anales Soc. cient. argent., 1883, v. 15, p. 151-169.)

Separate, Buenos Aires, 1883. t.-p. cover, 21 p. [t.-p., p. 151-169], 25 × 16, t 18.5 × 10.5.

Synonymical and other notes on species of *heterocera* (all exclusively South American except *cindaphia bicoloralis*, which also occurs in North America); describes new species, viz.: *sphinx baruta*, *psoloptera meisteri*, *dirphia caisa*, *hyperchiria lama*, *micratlacus fulviventris*, *coenopeta fucosa*, *chadaca missionum*, *rhopalodes argentina*, *tomopteryx viduaria*, and *lagynopteryx valdiviana*, all from South America. *G: D.* (3627)

Bethune, C: James Stewart, *et al.* [Food-habits of larvae of Colorado potato beetle and other insects.] (Can. entom., Nov. 1879, v. 11, p. 202.)

Remarks by C: J. S. Bethune, W: S. Barnard, J. A. Lintner, W: Saunders, S: H. Scudder and J: H: Comstock, on the feeding of larvae of *doryphora decemlineata* on *asclepias* and other plants and on one another, and on the carnivorous propensities of larvae of *noctuidae* and *lycaenidae*, especially of *heliothis armigera;* phytophagic variation of *doryphora decemlineata*. *B: P. M.* (3628)

Blaney, Dwight. Entomological notes from Laconia, N. H. (Ornithologist and oologist, Aug. 1884, v. 9, p. 101-102, 20 cm.)

List of butterflies taken in Laconia, N. H., with notes on the habits of a few species. *G: D.* (3629)

Bowditch, F: C. Notes on certain coleoptera. (Journ. Bost. zool. soc., July 1882, v. 1, p. 27-28.)

Describes briefly the transformations of *eucrada humeralis;* records the hibernation of several *buprestidae* in the loose bark at the foot of the trees and mentions the liking for sugar exhibited by *purpuricenus humeralis*. *R. H.* (3630)

Brauer, Friedrich. Biologisches über blutsaugende insecten mit besonderer berücksichtigung ihrer mundtheile. (Schr. d. vereins zur verbreitung naturw. kenntnisse in Wien, 1880-1881, bd. 21, p. 255-273.)

Habits and mouth-parts of *pulicidae, culex, simulium, phlebotomus, tabanidae, stomoxys, glossina, asilus, cimex* and *pediculus;* on phthiriasis. *G: D.* (3631)

Brunner von Wattenwyl, Carl. [Neues organ bei acridiern.] (Verhandl. k.-k. zool.-bot. gesells. in Wien, 1879, bd. 29; Sitz.-ber., p. 26-27.)

Notice of an organ of doubtful function on the femur of certain *acrididae.* *G: D.* (3632)

Brush, E. F. Ameisen gegen skorbut. (Deutsch-amer. apotheker-zeit., 1 Apr. 1883, jahrg. 4, p. 49, 7 cm.)

Wood-choppers in Maine eat masses of black ants as a remedy for scurvy; a concentrated tincture of the ants, or other preparation of formic acid, useful for the same purpose. *B: P. M.* (3633)

Buckler, W: Description of the larva, &c., of *hydroecia nictitans.* (Entom. mo. mag., Feb. 1882, v. 18, p. 195-197.)

Describes larva and pupa of *hydroecia nictitans.* *G: D.* (3634)

Buckler, W: Some points in the natural history of *papilio machaon.* (Entom. mo. mag., April 1882, v. 18, p. 244-249.)

Account of the egg and different larval stages of *papilio machaon.* *G: D.* (3635)

Buckton, G: Bowdler. Note on the action of potassium cyanide on organic colouring matter. (Entom. mo. mag., Sept. 1884, v. 21, p. 82.)

The mode by which potassium cyanide acts in killing insects and in changing their colors. *G: D.* (3636)

Bush, Isidor. Phylloxera galls: inconstancy in their appearance. (Amer. entom., Sep. 1880, v. 3, n. s., v. 1, p. 226, 6 cm.)

Apparent change in the preferences of *phylloxera vitifoliae* for varieties and species of *vitis* on which to produce its galls. *B: P. M.* (3637)

Butler, Arthur Gardiner. Descriptions of some apparently new species of *arctiidae* from North America. (Entom. mo. mag., Nov. 1881, v. 18, p. 135-136.)

Describes *arctia dodgei, a. ochreata,* and *a. rhoda,* 3 new species. *G: D.* (3638)

Cameron, P. On parthenogenesis in the *tenthredinidae.* (Entom. mo. mag., Oct. 1884, v. 21, p. 103-104.)

Gives a list of the thirteen British species of *tenthredinidae* known to be parthenogenetic. *G: D.* (3639)

Cameron, P. On a simple method of mounting objects for microscopic examination. (Proc. nat. hist. soc. Glasgow, 1880-1881, v. 5, pt. 1, p. 4-7.)

Mode of mounting specimens dry or in Canada balsam in pieces of cardboard so as to be pinned in a collection of insects; mode of drying small larvae for preservation in collections. *G: D.* (3640)

Candèze, Ernest. [La *doryphora decemlineata.*] (Ann. soc. entom. Belg., 1875, v. 18; Comptes-rendus, p. 12-17.)

Separate, entitled, "La *doryphora decemlineata.* Lecture faite à la séance du 6 février 1875, de la Société entomologique de Belgique." [Bruxelles, 1875.] 6 p., 25 × 16, t 18 × 10.5.

Opposes the prohibition of importation of American potatoes into Belgium, claiming that there is little to be feared in Europe from *doryphora.* *G: D.* (3641)

Candèze, Ernest. La *doryphora decemlineata.* Lecture faite à la séance du 6 février 1875, de la Société entomologique de Belgique. [Bruxelles, 1875.] 6 p., 25 × 16, t 18× 10.5.

Separate of author's "[La *doryphora decemlineata*]" (Ann. soc. entom. Belg., 1875, v. 18; Comptes-rendus, p. 12-17) [Rec., 3641]. *G: D.* (3642)

Carrington, J: T. Sallows. (Entomologist, April 1883, v. 16, p. 85-89.)

Modes of collecting the insects that frequent the catkins of sallow [*salix*] in England. *G: D.* (3643)

Chapman, T. Note on a dark variety of *cicindela campestris.* (Entom. mo. mag., April 1867, v. 3, p. 251.)

Note upon the capture of *cicindela campestris* var. *funebris,* in Scotland. *G: D.* (3644)

Christy, Robert Miller. Memoranda on insects in their relation to flowers. (Entomologist, 1883, v. 16: July, p. 145-150; Aug., p. 177-181.)

Details of observations upon the methodic habits of insects — principally fossorial hymenoptera — when visiting flowers. *G: D.* (3645)

Edwards, H: The caterpillar pest. An interesting communication from a well known actor and entomologist. (Evening telegram [N. Y.], 3 July 1883, v. 17, no. 5543, p. 3, col. 2, 25 cm.)

Ravages of and means against *orgyia leucostigma* in New York city. *B: P. M.* (3646)

Edwards, W: H: Description of the preparatory stages of *papilio philenor*, Linn. (Can. entom., Jan. 1881, v. 13, p. 9-14.)

Describes egg, larva, and chrysalis of *papilio philenor.* See also C: V. Riley's "Notes on *papilio philenor*" (Amer. nat., April [25 Mch.] 1881, v. 15, p. 327-329) [Rec., 3668]. *G: D.* (3647)

Edwards, W: H: On the length of life of butterflies. (Can. entom., Oct. 1881. v. 13, p. 205-214.)

Paper read before the American association for the advancement of science, at Cincinnati, 19 Aug. 1881, containing many notes on the longevity of diurnal lepidoptera. *A. K. D.* (3648)

Edwards, W: H: List of species of the diurnal lepidoptera of America north of Mexico. Boston, *Houghton, Mifflin & Co.*, 1884. t.-p. cover + t.-p. + adv. p. + 12 p. [without pagination], 32 × 25, t 19.5 × 14.5.

A list of the 612 species of diurnal lepidoptera of America north of Mexico, with their varieties. *G: D.* (3649)

Entomological club of the American association for the advancement of science —*President, 1878* (Joseph Albert Lintner). Annual address. (Can. entom., Sep. [Oct.] 1878, v. 10. p. 171-176.) [Rec., 1348.]

Increase in the number of known species of North American insects within forty years; progress made and making in the knowledge of the life-histories of our insects and in the extent and value of entomological collections and of entomological study and the publication of its results; the encouragement of entomological investigations by the United States government; commendation of biological investigations. *B: P. M.* (3650)

Fauvel, Albert. Annuaire entomologique pour 1873. Caen, 1873. t.-p. cover, t.-p., 2 + 122 p., 15 × 10, t 11 × 7. fr. 1.50.

Contents: —Calendar, with blanks for memoranda; address-list of coleopterists of France, Belgium, Holland, Rhine provinces and Switzerland; lists of entomological societies and periodicals in Europe; bibliography, new species and synonymy, captures, excursions, habits of species, and other notes mostly on coleoptera; modes of collecting and preserving insects; necrology; exchanges desired and books for sale. *G: D.* (3651)

Fauvel, Albert. Annuaire entomologique pour 1874. 2e année. Caen, 1874. t.-p. cover, 140 p., 15 × 10, t 11 × 7. fr. 1.75.

Contents of similar nature to those of preceding year [Rec., 3651]. *G: D.* (3652)

Fauvel, Albert. Annuaire entomologique pour 1875. 3e année. Caen, 1875. t.-p. cover, t.-p., 140 p., 15 × 10. t 11 × 7. fr. 1.75.

Contents of similar nature to those of preceding years [Rec., 3651-3652]. *G: D.* (3653)

Fauvel, Albert. Annuaire entomologique pour 1876. 4e année. Caen, 1876. t.-p. cover, t.-p., 150 p., 15 × 10. t 11 × 7. fr. 1.75.

Contents of similar nature to those of preceding years [Rec., 3651-3653]. *G: D.* (3654)

Fauvel, Albert. Annuaire entomologique pour 1877. 5e année. Caen, 1877. t.-p. cover, 148 p., 15 × 10, t 11 × 7. fr. 1.75.

Contents of similar nature to those of preceding years [Rec., 3651-3654]. *G: D.* (3655)

Fauvel, Albert. Annuaire entomologique pour 1878. 6e année. Caen, 1878. t.-p. cover, 137 p., 15 × 10, t 11 × 7. fr. 1.75.

Contents of similar nature to those of preceding years [Rec., 3651-3655]. *G: D.* (3656)

Fauvel, Albert. Annuaire entomologique pour 1879. 7e année. Caen, 1879. t.-p. cover, 136 p., 15 × 10. t 11 × 7. fr. 1.75.

Notice. (Bericht...d. entom., 1879, p. 111.)

Rev. (Entom. nachrichten. 1 Sept. 1879, jahrg. 5, p. 233.)

Contents of similar nature to those of preceding years [Rec., 3651-3656]. *G: D.* (3657)

Fauvel, Albert. Annuaire entomologique pour 1880. 8e année. Caen, 1880. t.-p. cover, 139 p., 15 × 10, t 11 × 7. fr. 1.75.

Notice, by [F.] K [atter]. (Entom. nachrichten, 1880. jahrg. 6; Lit. rev., p. 49-50.)

Contents of similar nature to those of preceding years [Rec., 3651-3657]. *G: D.* (3658)

Grote, A: Radcliffe *and* **Wetherby**, Albert Gallatin. [Exhibition of moths. and on the number of broods of certain bombycid moths.] (Can. entom., Sep. [Oct.] 1878. v. 10, p. 176.) [Rec , 1348.]

Exhibition, by A: R. Grote, of some bombycid moths from Georgia, specifically named; *actias luna, samia cecropia, telea polyphemus*. and *saturnia io* double-brooded in southern United States, but *citheronia regalis* only single-brooded there; statement, by A. G. Wetherby, that many of the above-named moths are also double-brooded in north-western [northern central] United States. *B: P. M.* (3659)

Harrington, W: Hague. List of Ottawa coleoptera. (Trans. Ottawa field-nat. club, 1883-1884 [Oct. 1884], v. 2, no. 1, p. 67-85.)

List of 1003 species of coleoptera belonging to 524 genera and representing 67 families which were taken in or near Ottawa, Ontario. *G: D.* (3660)

Harrington, W: Hague, **Fletcher**, James, *and* **Tyrrell**, J. B. Report of the entomological branch for the season of 1883. (Trans. Ottawa field-nat. club, 1883-1884 [Oct. 1884], v. 2, no. 1. p. 134-140.)

Notes on numerous species of insets from Ottawa, Ontario, and vicinity; notes are chiefly upon hymenoptera, lepidoptera, diptera, coleoptera and arachnida. *G: D.* (3661)

Instinct or reason displayed by insects (On).] (Can. entom., Sep. [Oct.] 1878, v. 10, p. 192.) [Rec., 1348.]

"Instinct and reason differ in degree and not in kind." *B: P. M.* (3662)

Lintner, Joseph Albert, *et al.* [On the collecting of noctuid moths by "sugaring", and on devices for collecting.] (Can. entom., Sep. [Oct.] 1878, v. 10, p. 191-192.) [Rec., 1348.]

Remarks, by J. A. Lintner, on the successful result of attempts to collect *noctuidae* by the process known as "sugaring"; by A. G. Wetherby, on the question of the rarity of certain species of insects; and by Emily A. Smith, E. B. Reed and J. A. Lintner on devices by which collecting-bottles might be handled conveniently, and on the proper use of lanterns. *B: P. M.* (3663)

Moseley, H: Nottidge. On the sound made by the death's head moth, "*acherontia atropos.*" (Nature, 20 June 1872, v. 6, p. 151-153, 115 cm., 1 fig.)

Rev., by A. W. B[ennett], entitled "The sound produced by the death's head moth." (Amer. nat. Mch. 1873 v. 7, p. 173-174.)

Outline of previous researches to discover the mode of sonifaction of *acherontia atropos;* experiments by which the author is led to believe that "the sound is produced by expiration through the proboscis," the air being expelled from a dome-shaped cavity in the upper part of the head. *G: D.* (3664)

Packard, Alpheus Spring, *jr.* The hessian fly. Habits and natural history. (Amer. entom., May 1880. v. 3, n. s., v. 1, p. 118-121, 127 cm., fig. 46.)

Advance reprint, with slight changes and omissions, of section entitled "Habits of the hessian fly" in author's "The hessian fly, its ravages" . . . (Bull. no. 4 U. S. entom. comm.) [Rec., 2207], p. 12-15, pl. 1; seasons and number of broods of *cecidomyia destructor;* method of oviposition; habits of larva. *B: P. M.* (3665)

Packard, Alpheus Spring, *jr.* The hessian fly.... (Amer. entom., June 1880, v. 3, n. s., v. 1, p. 140-141, 44 cm.)

Advance reprint of section entitled "Summary of the habits of and remedies against the hessian fly" in author's "The hessian fly, its ravages" . . . (Bull. no. 4 U. S. entom. comm.) [Rec., 2207], p. 38-39, and of paragraph entitled "Probable limits of the hessian fly" (*l. c.*, p. 38); summary of the life-history of *cecidomyia destructor;* its parasites, present and prospective geographical distribution, and means it. *B: P. M.* (3666)

Riley, C: Valentine. [Abstracts of some papers proposed to be read to the association.] (Can. entom., Sep. [Oct.] 1878, v. 10, p. 177-178.) [Rec., 1348.]

Hornia is parasitic on *bombus*, and differs in several points from other *meloidae;* application of vernacular names to larva and imago of *corydalus cornutus;* objections to A. S. Packard, jr's explanation of the manner in which *bombycidae* issue from their cocoons. *B: P. M.* (3667)

Riley, C: Valentine. Notes on *papilio philenor.* (Amer. nat., Apr., [25 Mch.] 1881, v. 15) (RILEY, C: V. Entomology.... [Apr. 1881]), p. 327-329, fig. 1-3.

Describes egg and newly-hatched larva of *papilio philenor;* figures imago, larva and pupa of this species; its food-plant (*aristolochia*) and geographical distribution, and its occurrence in swarms. *G: D.* (3668)

Smith, Emily Adella. [Damage done to oaks by *argyrolepia quercifoliana.*] (Can. entom., Sep. [Oct.] 1878, v. 10, p. 192.) [Rec., 1348.]

Statement that oak trees in Wisconsin and Illinois are injured by the larvae of *argyrolepia quercifoliana.* *B: P. M.* (3669)

Smith, Emily Adella, *et al.* [On the life history of *lecanium acericorticis*, and on means of destroying this and similar insects.] (Can. entom., Sep. [Oct.] 1878, v. 10, p. 176-177.) [Rec., 1348.]

Abstract of communication to Entomological club of A. A. A. S., by E. A. Smith, with remarks by T: Bassnett and C: V. Riley; life-history of *lecanium acericorticis;* the use of carbolic acid or of kerosene, applied with a fire extinguisher, recommended for the destruction of *coccidae.* *B: P. M.* (3670)

Suffrian, E. Synonymische miscellaneen. 30. (Entom. zeitung....Stettin, 1867, bd. 28, p. 445-449.)

Compares the varieties of *cicindela sexguttata* with those of *c. campestris*, with especial reference to the elytral markings. *G: D.* (3671)

Townsend, C: H: Tyler. Further remarks upon the variation of the elytral markings in *cicindela sex-guttata.* (Can. entom., July 1884, v. 16, p. 125-127.)

Additional remarks in continuation of the author's "On the variation of the elytral markings in *cicindela sexguttata.*" (Can. entom., Nov. 1883, v. 15, p. 205-208) [Rec., 3559]. *G: D.* (3672)

Trelease, W: The fertilization of *aquilegia vulgaris* [Rec., 2202].

Rev., by T: Meehan, entitled "Fertilization of *aquilegia.*" (Amer. nat., Feb. [25 Jan.] 1881, v. 15, p. 134-135, 4 cm.) *W: T.* (3673)

Trouvelot, L: The American silk worm. (Amer. nat., 1867, v. 1: Mch., p. 30-38; Apr., p. 85-94; May, p. 145-149; pl. 5-6.)

Description and figures of different stages of *telea polyphemus*, with an account of its life-history; its mode of exit from cocoon, expanding of wings, oviposition, hatching, rate of growth and consumption of food, number of molts, mode of molting, food-plants, enemies, power of sight in larva, presence of immature eggs in larva, structure of silk-glands; effect of temperature on pupae, and of exclusion of air from pupae; figure of *ophion macrurum*, a parasite; processes of silk-culture with this species. *G: D.* (3674)

ENTOMOLOGICAL ITEMS.

STRAWBERRY PLANTS are damaged in parts of Michigan by *Otiorhynchus ligneus*.

WE ARE sorry to note that *Science record*, which its editor, Mr. J: S. Kingsley, has lately improved in many respects, has suspended publication.

F. MINÀ-PALUMBO, in an article concluded in the October-November numero of *Il naturalista siciliano*, enumerates 301 species of European lepidoptera which feed on oak.

THE ENTOMOLOGICAL club "Iris," in Dresden, has just reawakened to new activity and we are in receipt of numero one of its "Correspondenzblatt" issued for October 1884.

DR. AUGUST WEISMANN of Freiburg has been nominated as successor of Prof. K. T. von Siebold in the University of Münich. Prof. von Siebold has been made an *emeritus*.

AT THE June (1883) meeting of the Linnean society of New South Wales, Mr. Deane exhibited sandstone penetrated by burrows apparently dug by some hymenopterous insect.

A NEW locality reported to be infected by phylloxera is in the vicinity of Caltagirone, in Sicily. The same insect has been found near Linz, a town on the Rhine not far from Coblenz.

DR. W. G. STEVENSON reports, in the Transactions of the Vassar brothers institute, 1883-1884, v. 2, p. 135, a capture of *Papilio turnus* var. *glaucus* at Poughkeepsie, N. Y., in August 1882.

PHYLLOXERA HAS made its appearance in the Pomological institute of Proskau (Silesia). It is hoped, however, that the spread of the disease may yet be prevented.—*Science*, 21 Nov. 1884, v. 4. p. 481.

MISS JENNIE M. ARMS, teacher of natural history in Boston, Mass., read a paper on "Observation lessons on insects," at the fortieth annual meeting of the Massachusetts teachers' association, 29 to 31 December 1884, in Boston, Mass.

ONE COPY of no. 4 of vol 2 of *American entomologist* wanted. Also one copy of C: V. Riley's 6th annual report of the state entomologist of Missouri. Riley's 3d report offered in exchange or for sale. Address, stating price, B: PICKMAN MANN, Washington, D. C.

IN THE meeting of the Entomological society of London, on 1 Oct. 1884, Baron C: R. Osten Sacken communicated "Facts concerning the importation, or non-importation of diptera into distant lands" in which considerable curious information about North American diptera was given.

EXCHANGE OF EUROPEAN AND AMERICAN COLEOPTERA.—Mr. C. F. Lange, of Annaberg, in Saxony, offers to exchange European for American coleoptera, and refers to Mr. John B. Smith, 290 3d avenue, Brooklyn, N. Y., to certify that his specimens are well prepared and correctly named.

MR. S. H. SCUDDER'S memoir upon Dr. J: L. LeConte, read before the National academy of sciences, 17 April 1884, published in vol. 11 of the Transactions of the American entomological society and as a separate, contains a fine portrait of Dr. LeConte and an account of the ancestry of his family.

MR. H. DONCKIER DE DONCEEL gives a list of the *anthribidae* described since the publication of Gemminger and Harold's catalog of coleoptera, in the Compte-rendu of the Belgian entomological society for 8 Nov. 1884. Twenty-four new species and ten new genera are accredited to North America.

SANDSTONE HAS been found perforated in all directions and to a considerable depth by an undetermined species of bee in New

South Wales. Mr. J. Norton exhibited specimens of this perforated sandstone, from Springwood, Blue Mountains, at the July meeting of the Linnean society of New South Wales.

MR. A. C. HORNER notes in the *Entomologist* for October 1884 that *Pterostichus melanarius*, an English species, attacks strawberries, and T. H. Hart, in the November numero of the same periodical, among other notes on phytophagic *carabidae*, mentions having seen "three specimens of *Carabus violaceus* disputing possession of a half-rotten apple."

IN A paper read before the Linnean society of New South Wales, Oct. 29 last, Dr. Lendenfeld contests the views of the French physiologists, that the position and movements of the wings of insects are merely the results of the mechanical influence of the resisting air, and gives instances where muscular contraction had been clearly proved.— *Science*, 19 Dec. 1884, v. 4, p. 562.

AT THE June meeting of the Linnean society of New South Wales, Mr. William Macleay exhibited, on behalf of Mr. Wilkinson, "a number of *Helix*-like shells, wound spirally round the leaf-stalks of a species of Eucalyptus, at Branxton, on the Hunter. These shells, though calcareous, were pronounced not to be the production of any molluscous animal, and the general opinion was that they must be egg-cases of some insect."

MR. JAMES J. WALKER reports, in the *Entomologist's monthly magazine* for Dec. 1884, that he found *Dermestes vulpinus*, *Necrobia rufipes*, *Corynetes violaceus* and *Alphitobius piceus* in amazing abundance in a bone-boiling establishment in Sheppey, England. The first species literally blackened the whitewashed walls of the rooms, and their larvae did much damage by riddling the woodwork of the building with holes in which they pupated.

THE COMPOSITION and properties of the light emitted by insects of the Pyrophore genus form the subject of a paper recently presented to the Paris academy of sciences by Aubert and P. Dubois. The spectrum of the light, examined by the spectroscope, is very beautiful, but destitute of dark bands. When, however, the intensity diminishes, the red and orange disappear, and the green and yellow only remain.— *Science*, 28 Nov. 1884, v. 4, p. 505.

PROF. A. J: COOK read a paper before the Natural-history society of the Michigan agricultural college, on 12 Sept., on extra-floral nectar. "Bees had been noticed to be extensively at work on the heads of grasses. These proved to be covered with the sweetish secretion due to ergot. The honey made from this material was very agreeable to the taste, ranking with the best, while honey made from the secretions of plant-lice is often very poor and disagreeable."

ACCORDING TO *Science* for 21 Nov. 1884 (Bulletin, p. 5), at the meeting of the Trenton natural-history society "Prof. Austin C. Apgar detailed his experiments with naphthalin on *Anthrenus scrophulariae*. Larvae left an infested object, and for two weeks lived in an air-tight case, in vapor so dense that it crystallized on the cover-glass. Even then they only apparently died, for, on removal, one revived and walked away. Herbarium mites were killed in half an hour in a tumbler loosely covered."

THE PRIZE offered by M. Adrien Dollfus for anatomical work on insects (see PSYCHE, May 1884, v. 4, p. 175) was divided between Ph. François, of Poitiers, and A. Lameere, of Brussels, whose papers were judged equally worthy of the prize. M. François' paper treated of the anatomy of the larva of *Vanessa polychloros*, and was published, with a plate, in the *Feuille des jeunes naturalistes* for November 1884; Mr. Lameere described the anatomy of the larva of *Lasio-*

campa potatoria, and his article appears in the December numero of the same periodical. *G. D.*

MISS MARY H. HINCKLEY, in her "Notes on the peeping frog, *Hyla pickeringii*, Leconte" (Mem. Bost. soc. nat. hist., May 1884, v. 3, no. 10), p. 317, writes in regard to enemies of this species that the tadpoles "are constantly being lessened in number by their enemies, the newts, water beetles, and the larvae of the beetles and dragon flies. On two occasions I have seen a spider (*Dolomedes sexpunctatus*) run along the surface of the water, suddenly dive, seize, and drag out on land a full-grown tadpole of this species; the spider coming out dry, evidently as much at home in as out of water."

IN THE new Hungarian entomological periodical, *Rovartani lapok* (v. 1, p. 171; Resumé, p. 2), Dr. O. Tömösváry records his observations "that two myriapods in captivity, a *Lithobius forficatus* and a *Geophilus foveolatus*, attacked each other with violence but soon withdrew. The latter species, during the attack and retreat, emitted from the extremity of its abdomen a light of bluish violet color, feeble, but nevertheless very perceptible in obscure light. This luminosity was visible scarcely a minute because the shining animal hid itself beneath the leaves at the bottom of its prison."

AT THE October meeting of the Natural science association of Staten Island, Mr. Davis exhibited a specimen of one of our green grasshoppers, *Conocephalus dissimilis*, which he had found without any head, and stridulating while perched upon a blade of grass. When touched by the finger, the insect did not close its wings tightly, as usual, but let them remain far apart. It had evidently not been long decapitated; for, when captured, the muscles in the thorax had their normal appearance. But gradually the tissues dried, and on the third day of its captivity it died without having stridulated again, though every means thought of was employed to induce it.—*Science*, 7 Nov. 1884, v. 4, p. 448.

THE INVESTIGATIONS of M. Carlet enable him to affirm that the poison-apparatus of the hymenoptera is always composed of two distinct glandular systems, the one with a strongly acid, the other with a feebly alkaline secretion. These two systems unite at the sheath of the sting. The resultant venom is always acid. The action of this venom upon some animals, as rabbits, frogs and certain beetles, is slight, but the domestic fly and the flesh fly are killed immediately by it. The inoculation of a fly with the secretion of one of the glands does not produce death until after a considerable time, but death follows very quickly if the same fly is subjected to a second inoculation, this time with the secretion of the other gland.—*Amer. nat.*, Dec. 1884, v. 18, p. 1270.

ACCORDING TO J. Murie's report of the meeting of the Linnean society of London, 7 Feb. 1884, printed in the *Zoologischer anzeiger* for 3 March 1884, "Mr. B. J. Lowne gave an interesting communication embodying his researches on the compound vision of insects. He compares the structures of the simple ocellus with those of the compound ocellus (common in larval insects) and with those of the compound eye. The compound eye according to him is but composed of aggregated compound ocelli, or the latter in the larval insect is merely equivalent to a single segment of a compound eye. He refers to the development of the compound eye and points out that in many larvae during molting stages the "segregate" retina is finally replaced by another. He describes a deep spindle-like layer in intimate connection with the nervous structures and which he regards as playing an important part in the phenomena of compound vision, rather than that this kind of vision is solely dependent on the number of corneal facets."

MR. WOOD MASON of the Calcutta Indian museum has recently drawn up a report on

those insects from which the tea-gardens of Assam most suffer. He says the tea-bug or 'mosquito-blight,' and the tea-mite or 'red spider,' are the only two insects which are at present known to do such injury as to materially diminish the profits of the owners. Both these insects pass their whole lives on the tea-plant, and have never been found on any other plant. Such, at least, is the result of the most careful investigation. The mite lives in societies on the upper portion of the full-grown leaves, beneath an exceedingly delicate web which it spins for itself as a shelter. It punctures the leaves, and then pumps out the liquid contents of the epidermis. The only remedy which has been discovered to check their ravages, and it has not proved very effectual, is to sprinkle the affected bushes with muddy water. The tea-bug is still more destructive, and particularly to the trees of the milder juice; for those which afford a strong and rasping liquor enjoy an almost complete immunity from its attack. Mr. Wood Mason appends to his report engravings of these destructive creatures.—*Science*, 31 Oct. 1884, v. 4, p. 426.

AT THE meeting of the French entomological society held 23 July 1884, M. G. A. Poujade made the following remarks:

"Prof. Édouard Bureau has stated (Ann. soc. entom. Fr., 1854; Bull., p. 22) that in lepidoptera of the genus *Brephos*, specimens which had been dried six days showed evident spontaneous movements of the genital organs, which continued two days, but toward the last part of the time these movements were only produced when the extremity of the abdomen was touched. I have observed the same peculiarity in a *Rhodocera rhamni*, the extremity of the abdomen still moving when the rest of the insect was perfectly dry.

A few days ago some one gave me a male *Lucanus cervus* which had been killed with vinegar five or six days before; the flabbiness of the joints left no doubt as to the death of the animal, — the penis alone, which was partly exserted, had very evident movements which lasted two or three days longer.

These facts, as M. Bureau has said, prove the predominance of the genital functions above all other functions, and it is not without interest to compare these observations with another well-known fact, the prolongation of life among insects that have not paired."

AMONG NATURALISTS who have been more or less interested in entomology we have lately noticed announcements of the following deaths: Dr. Alfred Edmund Brehm, born in 1829, in Renthendorf, Germany, where he died 11 Nov. 1884; well-known as the editor of the "Illustrirtes thierleben." Dr. Ernst Carstanjen, professor of chemistry in Leipzig university and lepidopterist, died 13 July 1884, in the forty-ninth year of his age. Auguste Chevrolat, a Parisian coleopterist and author of many entomological papers, died 16 Dec. 1884, in the eighty-sixth year of his age. O. J. Fahraeus, a coleopterist of Stockholm, Sweden, died in that place, 28 May 1884, aged eighty-eight. Leopold Joseph Fitzinger, zoologist, born 13 April 1802, in Vienna, Austria, died 22 Sept. 1884, in Hietzing, near Vienna. Dr. Arnold Förster, professor in Aachen, Germany, and hymenopterist, born 21 Jan. 1810, in Aachen, died 13 Aug. 1884, in the same place. A. Keferstein, lepidopterist, died 28 Nov. 1884, in Erfurt, Germany. Johann Gottfried Gottlieb Mühlig, lepidopterist, died 12 April 1884, at Frankfort-a.-Main, Germany, nearly seventy-two years old. Joseph Antoine Maximilian Perty, professor from 1834-1875 in the university at Berne, Switzerland, died at Berne, 8 Aug. 1884, nearly eighty years old. Edmond Tömösváry, a Hungarian naturalist, died 18 Aug. 1884, at Deva. Ernst Wehncke, a merchant in Harburg, Germany, and a specialist in *dytiscidae* and *hydrophilidae*, born 15 March 1835, died 19 Nov. 1883, in Harburg.

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JANUARY-MARCH 1885.

CONTENTS:

ADVERTISEMENTS 238
THE INSECTS OF BETULA IN NORTH AMERICA—*Anna Katherina Dimmock* . 239-243
SYSTEMATIC POSITION OF THE GENUS APIOCERA—*Daniel William Coquillett* . 243-244
THE GEOLOGICAL HISTORY OF MYRIOPODS AND ARACHNIDS—*Samuel Hubbard Scudder* 245-250
THE DOUBLE ROLE OF THE STING OF THE HONEY-BEE 251-252
PERMANENT MOUNTING OF TRACHEAE OF INSECTS—*F. T. Hazlewood* . . . 253
PROCEEDINGS OF SOCIETIES—Zoological Society of London—Linnean Society of London 253-254
BIBLIOGRAPHICAL RECORD, no. 3675-3787 255-264
ENTOMOLOGICAL ITEMS 265-268

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PSYCHE.

THE INSECTS OF *BETULA* IN NORTH AMERICA.

BY ANNA KATHERINA DIMMOCK, CAMBRIDGE, MASS.

My attention was first drawn to the number of insects which feed upon plants of the genus *Betula* when I set out to make a collection illustrating the different stages of insects found on *Betula alba*. I had exhibited stages of 39 determined species, and intended to publish a simple list of these, but so many additions to the list were found later in scattered publications that further notes were added. Finally, after the publication of Dr. G: Dimmock's "Notes on *pterophoridae* of North America,"[1] I determined to put the notes in the form adopted in that article, and to include the American insects of the entire genus *Betula*. The notes have steadily increased in bulk, until they now include 107 determined species. This number would be still further augmented by the determination of several species which I have reared from *Betula alba*. Kaltenbach[2] gives 270 European birch-feeding insects, and where the same species of insects are found in America I have added them to this list. Packard[3] enumerates only 19 species of American insects from *Betula*. The numerous bibliographical references here included, which were selected from those accumulated in the progress of my work, refer generally to easily accessible works and are not inappropriate in a bibliographical journal like PSYCHE. Most of the citations have been verified,—a few are quoted. For many of them and for the free use of notes I am indebted to my husband, Dr. G: Dimmock. We have for several years reared and studied insects together, and some of the larvae mentioned in this article will be described by him later. My thanks are due further to Prof. C: H: Fernald, Dr. S: W. Williston, and Messrs. S: Henshaw and R. Thaxter, for identifying insects belonging respectively to the microlepidoptera, diptera, coleoptera, and macrolepidoptera.

Quite extended lists of food-plants have been compiled in the case of certain lepidoptera, because these insects are often reared for pleasure, and because an accurate knowledge of food-plants is desirable, even for polyphag-

[1] Psyche, Sept.-Oct. 1882, v. 3, p. 402-404.

[2] Kaltenbach, J. H. Die pflanzenfeinde aus der classe der insecten. Stuttgart, 1874.

[3] Bull. 7, U. S. entom. comm., Washington, 1881.

ous species. Here it might be added that *Betula alba* is very useful in rearing certain polyphagous species, since its leaves remain in good condition for a long time, and are the favorite food-plant of many insects. Certain polyphagous species, as *Attacus cecropia*, do not feed readily on other food-plants after having eaten birch. Larvae (especially of *geometridae*) of which the food-plant is unknown, can often be reared successfully on *Betula alba*, a fact to which I owe my successful rearing of *Endropia armataria*.

ORTHOPTERA.

Phaneroptera curvicauda De Geer (Mém. hist. ins., 1773, v. 3, p. 446, pl. 38, fig. 3). This species has been figured, together with the structure of its ovipositor, by Riley (6th rept. state entom. Mo., 1874, p. 164-166), who also gives descriptions of the younger stages, and eggs. Miss Murtfeldt (*l. c.*) describes the mode of oviposition: the eggs are laid in the margin of leaves—often of oak—between the upper and lower epidermis. Altho Riley writes (*l. c.*), "I have had as many as five of these eggs deposited in a single leaf, in one contiguous row, yet they are more often single," yet a single tender leaf of *Betula alba*, taken at Belmont, Mass., measuring about 8 cm. in length, had the entire margin filled with eggs, presumably of this species. Only two or three leaves were found thus attacked, and the one of which the size is given above contained 102 eggs.

Caloptenus femur-rubrum De Geer (Mém. hist. ins., 1773, v. 3, p. 498, pl. 42, fig. 5) often strips the leaves from low bushes of *Betula alba* about Cambridge, Mass.

RHYNCHOTA.

Eriosoma tessellata Fitch (4th ann. rept. [N. Y.] state cab. nat. hist., 1851, p. 68). According to Glover (Rept. U. S. commiss. agric., 1876, p. 39) this species has been found in Maryland upon twigs of *Betula*.

Callipterus betulaecolens Riley and Monell (Bull. U. S. geol. and geog. surv. terr., 1879, v. 5, p. 30-31) [? = *Aphis betulaecolens* Fitch (4th ann. rept. [N. Y.] state cab. nat. hist., 1851, p. 66)]. Said by Fitch and Monell to feed on birch leaves.

Calaphis betulella Walsh (Proc. Entom. soc. Phil., Dec. 1862, v. 1, p. 301-302). Walsh (*l. c.*, p. 302) says this species is abundant in Illinois on *Betula nigra*.

Athysanus variabilis Fitch (4th ann. rept. [N. Y.] state cab. nat. hist., 1851, p. 60) is stated by Fitch (*l. c.*) to be "abundant on birch trees, in June," and the same author states (Ann. rept. N. Y. state agric. soc., 1858, v. 18, p. 853) that this species punctures leaves and succulent shoots of birch. A brief description of this insect is given by Packard (Bull. 7, U. S. entom. comm., 1881, p. 128).

Athysanus abietis Fitch (4th ann. rept. [N. Y.] state cab. nat. hist., 1851, p. 60) is stated by Fitch (Ann. rept. N. Y. state agric. soc., 1857, v. 17, p. 749) to feed on birch. Packard (Bull. 7, U. S. entom. comm., 1881, p. 235) briefly describes the species and gives *Betula* as food-plant.

Athysanus minor Fitch (4th ann. rept. [N. Y.] state cab. nat. hist., 1851, p. 60). Fitch (*l. c.*) writes "Common on birch trees," and adds (Ann. rept. N. Y. state agric. soc., 1858, v. 18, p. 853) that it punctures birch leaves. Packard (Bull. 7, U. S. entom. comm., 1881, p. 128) briefly describes this species.

Athysanus fenestratus Fitch (4th ann. rept. [N. Y.] state cab. nat. hist., 1851, p. 60) is stated by Fitch (*l. c.*) to be found "on birch trees," and (Ann. rept. N. Y. state agric. soc., 1858, v. 18, p. 853) to puncture birch leaves. This species is briefly described by Packard (Bull. 7, U. S. entom. comm., 1881, p. 128).

Thelia univittata Harris (Treatise on ins. injur. veg., 1842, p. 180). One specimen taken sucking juices of a twig of *Betula alba*, June 1884. This species is found on oak, ac-

cording to Harris (*l. c.*), where it is common in July, according to Packard (Bull. 7, U. S. entom. comm., 1881, p. 37).

Enchenopa binotata Say (Appendix Long's exped., 1824, p. 301-302). Common on twigs of *Betula alba*. Riley (Amer. entom., Aug. 1869, v. 1, p 248) says its favorite home is *Ptelea trifolium*, but gives grape (*Vitis*) and red-bud (*Cercis*) as food-plants. Its egg is described in Amer. entom., Oct. 1880, v. 3, p. 254. Lintner (1st ann. rept. state entom. N. Y., 1882, p. 281-288) gives an excellent general account of imago and eggs, both of which are figured. As food-plants he adds *Celastrus scandens* and, upon the authority of others, *Juglans* and *Robinia*.

Bythoscopus seminudus Say (Journ. Acad. nat. sci. Phil., 1829 [Mch. 1831], v. 6, p. 307). Fitch (4th ann. rept. [N. Y.] state cab. nat. hist., 1851, p. 58) writes "Found on birch trees."

Tingis juglandis Fitch (Ann. rept. N. Y. state agric. soc., 1856, v. 16, p. 466-467) is normally found, according to that author (*l. c.*) on *Juglans cinerea*, but is sometimes met with also on *Betula*, *Salix*, and other trees. Packard (Bull. 7, U. S. entom. comm., 1881, p. 88) briefly describes this species, and mentions its food-plants.

Diptera.

Mallota posticata Fabr. (Syst. antl., 1805, p. 237). Packard (Guide study ins., 1869, p. 399) figures the pupa and imago of this species under the name of *Merodon bardus* Say. Lintner (1st ann. rept. state entom. N. Y., 1882, p. 211-216) gives an extended account of this insect, figuring the puparium and imago, and describing the larvae, which were taken from decaying birch wood.

Lonchaea ?polita Say (Journ. Acad. nat. sci. Phil., 1830, v. 6, p. 188). Reared in Cambridge, Mass., from decaying *Polyporus betulinus*, a fungus parasitic on dead trunks of *Betula alba*.

Lepidoptera.

Argyresthia goedartella Linn. (Syst. nat., 1758, *ed. 10*, p. 897). Fabricius (Syst. entom., 1775, p. 664) writes of this species "Habitat in alnetis, in betulae gemmis," and Kaltenbach (Planzenfeinde, 1872, p. 604-605) states that the larvae of this species live in the catkins of *Betula* and *Alnus*. Chambers (Can. entom., Aug. 1875, v. 7, p. 144-145) notes the discovery of this species in North America, and, after describing the imago, adds "The larva feeds under the bark and in the young shoots of the birch in March and April." A. Balding (Entom. monthly mag., Feb. 1885, v. 21, p. 203-206) describes the larva, which he found feeding in catkins of *Betula* and *Alnus*.

Cryptolechia confertella Walk. (List lep. ins. Brit. mus., 1864, pt. 29, p. 563). The larvae of this species are common upon *Betula alba* during August and the early part of September. The larva feeds in a rolled portion of the margin of the leaf, where pupation takes place, lasting from three weeks to a month.

Paedisca similana Hübn. (Samml. auserl. vögel u. schmett., 1792, fig. 71). Kaltenbach (Pflanzenfeinde, 1872, p. 602) gives a very brief description of the larva of this species, which feeds upon *Betula*.

Paedisca transmissana Walk. (List lep. ins. Brit. mus., 1863, pt. 28, p. 375). The larva of this species is common, during October, about Cambridge, Mass., where it eats out the inside of the sterile catkins of *Betula alba*. It hibernates as pupa.

Paedisca solicitana Walk. (List lepid. ins. Brit. mus., 1863, pt. 28, p. 387). Fernald (Trans. Amer. entom. soc., 1882, v. 10, p. 40) says of this species "Food.—*Betula alba* var. *populifolia*."

Sericoris urticana Hübn. (Samml. europ. schmett., Tort., 1800?, fig. 65). Kaltenbach (Pflanzenfeinde, 1872, p. 601) gives a very brief description of the larva, following Zeller (Isis, 1846, p. 229) and among other food-plants mentions *Betula*.

Penthina albeolana Zeller (Verhandl. k.-k. zool.-bot. gesell. Wien., jahrg. 1875, 1876, bd. 25; Abh., p. 262-263, pl. 8, fig. 12). A single larva taken 4 Sept. 1882, at Cambridge, Mass., on *Betula alba*, pupated 6 Sept., and appeared as imago 24 May 1883. This species is evidently two-brooded, as Burgess took the specimen from which Zeller described the species, on 15 Aug., in Massachusetts.

Penthina dimidiana Sodoffsky (Bull. Soc. impér. natur. Mosc., 1830, v. 2, p. 73, pl. 7). Kaltenbach (Pflanzenfeinde, 1872, p. 615) briefly describes the larva of this species, which feeds upon *Betula* and on several other plants.

Penthina capreana Hübn. (Samml. europ. schmett., Tort., 1800?, fig. 250). Kaltenbach (Pflanzenfeinde, 1872, p. 601) compiles a brief description of the larva of this species, which feeds upon *Betula* and *Salix*.

Eccopsis ?var. of *permundana* Clemens (Proc. Acad. nat. sci. Phil., 1860, p. 356-357). Two specimens reared from larvae taken in Cambridge, Mass., 17 June 1883, on *Betula alba*. Pupated about 30 June; one specimen emerged as imago 10 July and the other 15 July 1883. Clemens (*l. c.*) says of *E. permundana*, "The larva binds together the terminal leaves of *Spiraea*. It is pale green, touched with yellowish at the junction of the segments; head and shield black. The larva may be taken in the middle of June."

Eccopsis zelleriana Fernald (Trans. Amer. entom. soc., 1882, v. 10, p. 29) is said by its describer to feed upon "Leaves of *Betula alba* var. *populifolia*."

Lozotaenia musculana Hübn. (Samml. europ. schmett., Tort., 1800?, fig. 98). Kaltenbach (Pflanzenfeinde, 1872, p. 601) quotes Madame Lienig's description of the larva of this species, and states that the larvae, according to Fischer von Röslerstamm, feed between leaves of *Betula* and *Salix* which they have drawn together. Fernald (Trans. Amer. entom. soc., 1882, v. 10, p. 13) says, "Food.—In Europe, *Agrimonia*, *Genista*, *Solidago*, *Achillea*, *Stachys*, *Scrophularia*, *Rubus*, *Betula*, *Salix*, *Galium*, *Quercus*, *Pyrus* and *Tilia*."

Cacoecia cerasivorana Fitch (Ann. rept. N. Y. state agric. soc., 1856, p. 382, pl. 2, fig. 3). Fernald (Trans. Amer. entom. soc., 1882, v. 10, p. 11) writes of this species, "Food.— Cherry, *Betula alba* var. *populifolia*."

Cacoecia rosaceana Harris (Rept. ins. injur. veget., 1841, p. 348). Harris (*op. cit.*, p. 347-348, and *op. cit.*, 1862, p. 480) describes the larvae of this species. Description and figure of larva and imago by Packard (Guide study ins., 1869, p. 335, pl. 8, fig. 12). Description of larva, with figure of larva, pupa, and imago, by Saunders (Ann. rept. Entom. soc. Ontario, 1873, p. 14). Packard (Papilio, Nov.-Dec. 1882, v. 2, p. 182-183) says that he has reared this species from *Betula alba* var. *populifolia*, the moth appearing, in Maine, on the first of September. Coquillett (Papilio, May-June 1883, v. 3, p. 100-101) describes the larva carefully and gives the names of twenty-four species of food-plants. To his list may be added *Viburnum dentatum* and *Philadelphus coronarius*.

Teras ferrugana Schiffermüller (Syst. verz. d. schmett. d. Wiener gegend, 1776, p. 128). Kaltenbach (Pflanzenfeinde, 1872, p. 600) says, on authority of Treitschke, that this species feeds on *Betula* and more rarely on *Populus* and *Alnus;* Fernald (Trans. Amer. entom. soc., 1882, v. 10, p. 9), on authority of Heinemann, adds *Quercus*, and cites Walsh for authority that the species is inquilinous in galls of *Cynips salicis-strobiloides*. Packard (Papilio, Nov.-Dec. 1882, v. 2, p. 182) reared the species from a larva swept from *Pinus strobus*, on which he thinks the larvae feed, and gives a description of larva and pupa.

Teras niveana Fabr. (Mant. insect., 1787, v. 2, p. 233). Kaltenbach (Pflanzenfeinde, 1872, p. 600) says, on authority of Anton Schmid, that the larva of this species lives on *Betula*.

Several species of microlepidoptera which are still undetermined are very abundant on *Betula alba*, about Cambridge, Mass. Among them may be mentioned a case-bearer (? *Coleophora*), a species having a ridged cocoon (? *Bucculatrix*), a species the larva of which has a case made of successive rings of leaf-epidermis arranged in the form of a cornucopia, and a large leaf-miner belonging to some genus allied to *Lithocolletis;* the larvae of the last two species are found very late in the season, just before the leaves are destroyed by the frost.

Operophtera boreata Hübn. (Samml. europ. schmett., Spanner, 1796, fig. 413-414). Kaltenbach (Pflanzenfeinde, 1872, p. 599) gives *Betula* and *Fagus* as food-plants of this species. Packard (Mon. geom. moths, 1876, p. 199) quotes Newman's description of the larva of this species.

Rheumaptera hastata Linn. (Syst. nat., 1758. *ed. 10*, p. 527). Schmiedlein (Naturges. deutsch. schmett., 1805, p. 101-102) describes the larvae of this species, which he states live socially upon birch between the leaves which they spin together. Packard (Mon. geom. moths, 1876. p. 165-166) quotes Newman's description of the larva, in which it is stated to feed upon *Betula alba* and *Myrica gale*. Kaltenbach (Pflanzenfeinde. 1872. p. 413 and 599) compiles authorities for the following additional food-plants of this species: *Rhododendron hirsutum*, *Salix*, and *Vaccinium uliginosum*. A larva of this species, taken on *Betula alba*, at Belmont, Mass., 4 Aug. 1883, pupated 14 Aug., and appeared as imago 17 May 1884. This is one of the species of lepidoptera seen in swarms in parts of the White Mts., N. H., where specimens were taken from 8-14 July 1874 in the greatest abundance.

(*To be continued.*)

SYSTEMATIC POSITION OF THE GENUS *APIOCERA*.

BY DANIEL WILLIAM COQUILLETT, ANAHEIM, CAL.

In the Berliner entom. zeitschrift for 1883, p. 287-294, Baron Osten Sacken gives his reasons for placing the genus *Apiocera* among the *asilidae*. I am strongly of the opinion, however, that its proper place is among the *therevidae*—an opinion which the following facts would appear to fully justify.

In the Monographs of the diptera of North America, part 1, p. 22 and p. 24, Dr. Loew defines the families *asilidae* and *therevidae* in the following words:

"*Asilidae.*—Three basal cells much prolonged. Third longitudinal vein of the wings furcate, the two intercalary veins always present. Third joint of the antennae simple; under lip forming a horny sheath; empodium similar to a horny bristle."

"*Therevidae.*—Three basal cells much prolonged; the two intercalary veins present; third longitudinal vein furcate. Antennae with a terminal style of variable form, sometimes wanting. No empodium. Under lip fleshy."

In many of the larger *therevidae* the empodium, or third pulvillus, is present in the form of a slender bristle. The only character of importance, therefore, whereby either of these families may be distinguished from the other is the structure of the under lip or proboscis, which

is horny in the *asilidae* and fleshy in the *therevidae;* in other words, in the *therevidae* the proboscis terminates in two fleshy lips, while in the *asilidae* it is destitute of lips.

The genus *Apiocera* possesses all of the characters which Dr. Loew assigns to the *asilidae* except that the proboscis ends in two fleshy lips; and as this is the only character of importance wherein the *therevidae* differ from the *asilidae*, it naturally follows that this genus must be referred to the *therevidae*.

The characters which the Baron found to be common to *Apiocera* and the section *asilina* (*l. c.*, p. 289-291) also exist in the larger *therevidae*, with the exception of the closed marginal cell; moreover, the *therevidae* agree with *Apiocera* in several of the characters wherein this genus differs from the *asilina*. Thus the majority of the *therevidae* have a very short antennal style, as in *Apiocera;* whereas, in the *asilina* the style is usually long and bristle-like. In the *therevidae*, as in *Apiocera*, the face is very oblique, thus differing widely from the perpendicular or more or less convex face of the *asilina*, with its characteristic mystax, which is wanting in the *therevidae* and *Apiocera*. Moreover, the legs of the *therevidae* and *Apiocera* are weaker than in the *asilina*, and the tarsal joints are long and slender, instead of being short and robust. So that, if *Apiocera* is closely related to the *asilina*, it is still more closely related to the *therevidae*.

I admit that some species of *Apiocera* bear a very close resemblance to several species of *Erax;* however, our classification is not based upon a superficial resemblance, but upon the presence or absence of certain well-marked characters. Were we justified in placing the genus *Apiocera* in the family *asilidae* it would become necessary to remove all of the *therevidae* to this family; but such a course is not at all desirable, as the family *asilidae* is already a very extensive one, and the presence or absence of lips at the tip of the proboscis is a character of very easy application.

There is not an entomologist living whose opinion on any subject relating to the diptera has greater weight than that of the Baron Osten Sacken; and I would not have ventured an opinion contrary to one expressed by the Baron were I not convinced beyond a doubt of the correctness of my own views. From the few words which he gives concerning the relationship of *Apiocera* to the *therevidae* it is quite evident that he had not compared them with the same care that he compared this genus with the *asilina*.

The genus *Apiocera* is represented in my collection by twenty-two specimens, which were collected in this state (California) Some of the males agree in all essential characters with Osten Sacken's description of his *A. haruspex*, but the others differ to such a degree from these, and also from each other (there being scarcely any two specimens marked exactly alike) that I am at a loss to know whether to regard them as belonging to several distinct species, or as merely varieties of one very variable species; but I incline to the latter view of the case.

THE GEOLOGICAL HISTORY OF MYRIOPODS AND ARACHNIDS.

BY SAMUEL HUBBARD SCUDDER, CAMBRIDGE, MASS.

[Eighth annual address of the retiring president of the Cambridge Entomological Club.]

As the only subject of a general nature to which I have given recent attention I venture to invite you to review with me the geological history, first of myriopods and then of arachnids. Unusual attention has recently been paid to these animals, on account of the discovery of their remains in formations much earlier than those from which they had for a long time been known, and the relation of these discoveries to our previous knowledge will be best brought out by such a review, and it will, to a certain extent, be timely.

Our knowledge of the morphology, systematic position and extent of the myriopoda has been greatly increased within a recent period. The discovery of the minute *Pauropus* by Lubbock, and the study of this and allied forms by Ryder and others, have led to the establishment of the *pauropoda* as a type of living myriopods of equal taxonomic value to the two groups of *chilopoda* and *diplopoda* which had long been looked upon as the only divisions of the group. Modern investigations into the structure of the anomalous *Peripatus* have extended our ideas concerning the types allied to the myriopoda; while the strange forms revealed by recent researches in the carboniferous and devonian faunas have compelled us to recognize a wider range in its structure and a multiplication of its primary groups. The relations of ancient to modern forms of life prove far more important and interesting in the myriopoda than in either the arachnida or the hexapoda. That these relations are equally puzzling will appear from a brief review of the structure and development of the different groups.

In the early life of the *pauropoda* and of the *diplopoda* we have what may be fairly considered a true larval form, in which, for a brief period after leaving the egg, the body, much shorter than in after life, is provided with three pairs of legs borne upon the anterior segments of the body. These segments are never more fully provided with legs, though most of the segments posterior to them, both those which exist during this larval period and those which originate subsequently, bear two pairs. In the *chilopoda*, on the other hand, although the appendages of the anterior segments develop earlier than those behind them, there is no true larval condition, or perhaps one may say a larval condition is permanent, in that the same anterior legs become early and permanently developed as organs subsidiary to manducation, while the segments of the hinder part of the body develop only a single pair of legs.

The larval condition and resultant more or less highly developed metamorphosis of the higher hexapoda have been looked upon by many as a secondary after-development, and one which therefore in no sense gives any clue to the historical development of the group,

such as we frequently find mirrored in the embryonic growth of other animals. This view seems to be supported by a comparison of the modern and ancient types of myriopoda. The larval characteristics of the young of living types of myriopoda, marvelously analogous in their main features to those of the larvae of even the higher hexapoda, are confined to the apodal nature of the abbreviated abdomen, and more particularly to the specialized development of appendages on the segments directly following the head. This specialized condition of the anterior segments is, in a sense, analogous to the structure of the thorax of the hexapoda and is persistent throughout life,—in the *chilopoda* in a marked manner, in the other groups by the isolation of these segments as bearing but a single pair of legs. Now nothing of this specialization appears in the paleozoic types, of which of course we know only the mature forms; but the segments following the head differ in no point whatever from those of the remainder of the body in the character and number of their appendages. In one type, the *archipolypoda*, corresponding in a measure to the living type of *diplopoda*, two pairs of legs are borne on every segment; while in the other, the *protosyngnatha*, corresponding in a similar way to the *chilopoda*, a single pair of legs is found. If then we look upon the specialization of the segments (or the appendages of the segments) immediately following the head in living myriopodan types as a secondary development, or, we may say, as the initiatory stage in an acquiring metamorphosis; then we may perhaps consider the *archipolypoda* as the true prototypes of the *diplopoda* and possibly also of the *pauropoda*, and the *protosyngnatha* as the prototypes of the *chilopoda*.

In this view, one principal distinction between the modern *diplopoda* and *chilopoda* is shown to have existed from paleozoic times, viz: that in one group there are, over most of the body, to each dorsal scute two ventral scutes, each bearing a pair of legs; in the other group a single ventral scute with a single pair of legs; and it becomes interesting to inquire whether we can discover any indication of the condition of things from which this diversity of structures arose, and what was the line of development through which it passed. It will also help to determine the question, whether the dorsal or the ventral scutes of the *diplopoda* are to be looked upon as the homologs of those of the *chilopoda*; or, in other words, whether the dorsal scutes of the *diplopoda* are compound, or the ventral scutes of the same are to be looked upon as subsegments.

It should be remarked at the outset that what we know of the embryology of recent types shows that in the *diplopoda* two pairs of legs, in the *chilopoda* one pair, arise from each original body somite beyond the front portion of the body. This would indicate that the dorsal scutes of the two groups were homologous and the ventral scutes of the *diplopoda* should be looked upon as representing subsegments. This, however, is not the answer indicated by the paleontological evidence, nor is it what we should expect from, among

other things, the presence of stigmata on *each* of the ventral scutes in *diplopoda*.* All the carboniferous *archipolypoda* show a clear indication of the compound nature of the segments. Not only were the ventral scutes far more important and extensive than in the modern *diplopoda*, but some at least of the genera bore in addition to large stigmata outside the legs, a pair of segmental organs next the medioventral line on each ventral scute; the dorsal scute was also distinctly divided into two areas, an anterior and a posterior. In some types this latter distinction was more marked than in others, in some being carried so far that under certain conditions of preservation one would readily take them to be entirely separate; and this indeed appears to be absolutely the case in the older devonian forms, from the lower old red sandstone of Scotland. These show an apparently complete demarcation of the dorsal scutes of each segment as well as of the ventral, and present therefore a series of alternating larger and smaller segments, the larger bearing all the dorsal cuticular outgrowths, but each bearing a single pair of legs. Of this primal condition of the body segments the embryology of modern types gives no hint, its earliest indications showing nothing anterior to what must have been the condition of things wholly posterior to the paleozoic epoch, at least so far as the diplopodan series is concerned; nothing anterior, indeed, to the fixed condition of the present type. This indicates that the present dorsal scutes of *diplopoda* are compound and formed of two originally distinct scutes; and that, as a later development of a similar sort, the ventral scutes of the anterior segments have likewise consolidated and lost each one pair of appendages.

Under this view the line which we follow back from the *chilopoda* through the *protosyngnatha* is the more nearly allied to the simple stock type. Yet it is the other line which has been found earliest in the rocks, clearly showing that the actual origin of the myriopodan phylum must be looked for at the very first appearance of land animals; indeed the evidence that some of the carboniferous types were amphibious may warrant our belief that the type may have fairly originated among aquatic animals.

Fossil myriopoda were first made known from the carboniferous rocks, when Westwood figured, in Brodie's work on the older fossil insects of England, the remains of what he supposed to be a lepidopterous larva. There had been indeed earlier references by name merely to tertiary myriopoda from amber and from Aix (Serres), but it was not until the publications, thirty years ago, of Koch, Berendt and Menge, that the amber species were known, and to them hardly any additions have since been made. In 1859 Sir William Dawson published the first account of a paleozoic myriopod recognized as such, and since 1868 our horizon, as regards the older forms, has been widened materially by the publications of Messrs. Dohrn, Meek and

*They are only borne in general on alternate segments in *chilopoda*.

Worthen, Peach, Scudder, and Woodward, until to-day the number of forms known from pretertiary deposits is nearly as great as those from the tertiary.

The oldest known are those described by Page and Peach from the lower old red sandstone of Scotland — two species belonging to the *archipolypoda*. In the carboniferous formation the *archipolypoda* culminate, showing a considerable variety of generic types distinct from those of the devonian, and embracing nearly thirty species, of which by far the greater number come from America, and the few remaining ones from Great Britain, with possibly a single species from Germany. Four species, imperfectly known, which have been referred to *Iulus*, and which come from the permian of central Europe may belong to the *archipolypoda*. The only mesozoic forms known are the *Julopsis cretacea* of Heer, from Greenland, which is either an archipolypod or a diplopod (it is impossible to tell which), and the uncertain *Geophilus proavus* of Münster from Solenhofen, which is probably to be looked upon as a nereid worm.

The tertiary species are still known almost entirely from the work of Koch and Berendt, and belong entirely to the *diplopoda* and *chilopoda*, the larger proportion to the former. A few species, however, have been indicated from Aix, a single one described from the brown coal of Rott and one from the Green River deposits of North America.

The following table presents a view of the distribution of the myriopoda in time.

GEOLGICAL DISTRIBUTION OF MYRIOPODA.

The figures represent the number of species.	Paleozoic.			Mesozoic.			Cenozoic.				
	Devonian.	Carboniferous.	Dyas.	Lias.	Jurassic.	Cretaceous.	Eocene.	Oligocene.	Miocene.	Pliocene.	Modern Period.
Protosyngnatha	....	1	....	....	....	....	....	....	....	....	0
Chilopoda	....	....	....	....	(1?)	....	....	17	....	....	
Archipolypoda	2	31	(4?)	....	....	....	....	....	....	....	0
Diplopoda	....	....	....	....	....	(1?)	....	23	1	....	
Pauropoda	....	....	....	....	....	....	....	....	....	....	

The geological history of arachnida, as known at the present time, presents some points of interest. Only a portion of the great groups into which the order is divisible are represented in the older rocks, and these, which are not confined to the lower types, attain a degree of perfection and

a diversity of structure inconsistent with a belief in our having reached the primordial forms of this phylum in our retrograde search.

When, in 1858, Bronn published his prize essay on the distribution of fossils, only two species of pretertiary arachnida were known as such, one from the carboniferous and one from the jurassic formation, and the knowledge of tertiary forms was confined entirely to the then recently published work of Koch and Berendt on the species from amber. Since then Menge has increased somewhat our knowledge of the amber fauna, and it includes to-day nine-tenths or more of the known tertiary species. But it is only within the last fifteen years that our knowledge of pretertiary arachnida has been extended beyond the description of two or three species. The number is still exceedingly few — between 20 and 30 species — but it is being constantly extended, and the abundance of arthropoda brought to light in recent years in the carboniferous deposits of Allier, Bohemia, Scotland and Illinois leads us to expect an early and considerable extension of the list. This expectation is strengthened by Lindström's and Hunter's discoveries of scorpions in the upper Silurian rocks of Gotland and Scotland.

The forms that have been found fossil in the earlier formations have proved, as might be expected, to belong mostly to those having a dense integument, and in the two species believed to be true *araneae*, the abdomen was probably provided with more or less densely chitinous dorsal plates. With these two exceptions, and a single genus of *pedipalpi*, all the paleozoic arachnida (only a single mesozoic form is known) belong either to the *scorpionides* or to a peculiar group, the *anthracomarti*. This group is not found later, and the single known species of mesozoic arachnida* is a true *Aranea*. The paucity of remains of arachnida in mesozoic strata is somewhat remarkable. Besides the species mentioned above, only one other has been indicated, a species supposed to belong to the *araneae*, from the English lias.

Thanks to the amber deposits of Prussia, we know far more about the tertiary history of arachnida than would be possible if our sole reliance were on the rocks, the latter furnishing us with only about double the number of those occurring in pretertiary deposits. In the amber alone occur all the suborders of arachnida, excepting the *pedipalpi* and the already extinct *anthracomarti*, as well as all the families of *araneae* excepting one peculiar to the jurassic; but in the tertiary rocks neither *chelonethi*, *scorpiones* nor *opiliones* have been recognized; of the *pedipalpi*, a single species is referred to by Serres from the marnes of Aix, but too obscurely to take account of it.

Examining the *araneae* alone, which are far better represented in the tertiaries than are the other suborders, we find a very large number of extinct genera. In all, seventy-one are now known,

* *Palpipes* or *Phalangites*, believed even by Thorell to be an arachnid, has been shown by Seebach to be a stomatopodous crustacean.

sixty-six from Europe and thirteen from America, eight being common to both. Of these 37 are accounted extinct, 35 from Europe and 2 from America, and none of these have been found on both continents.

In the stratified tertiary deposits the same families of *araneae* are in every instance found in Europe and America, excepting the *dysderides*, which family has a single representative in America and none in Europe. It also appears that just those families which are represented abundantly in amber are also found to some extent in the American tertiary fauna, and (excepting, as before, the *dysderides*) in the European rocks.

It is only in the rocks of the temperate regions of Europe and North America that any arachnida have been found in a fossil state, and these, so far as the indications have any meaning, invariably point, whether in carboniferous or tertiary deposits, to a warmer climate than now obtains in the localities where they occur. This becomes more marked when we reach the tertiary rocks and can compare the types more closely with existing forms, a number of the genera, to which, for instance, the amber spiders belong, being now exclusively tropical.

The following table gives a general systematic view of the distribution of arachnida in the different geological formations since their first appearance in the upper silurian.

GEOLOGICAL DISTRIBUTION OF ARACHNIDA.

The figures represent the number of species.	Paleozoic.				Mesozoic.				Cenozoic.				Modern Period.
	Silurian.	Devonian.	Carboniferous.	Dyas.	Trias.	Lias.	Jurassic.	Cretaceous.	Eocene.	Oligocene.	Miocene.	Pliocene.	
Acari	....	....	....	....	....	....	....	....	33	1	2	....	
Chelonethi	....	....	....	....	....	....	....	....	9	....	....	....	
Anthracomarti	....	....	16										0
Pedipalpi	....	....	2	....	....	....	....	....	....	....	....	....	
Scorpiones	2	....	8	....	....	....	....	....	1	....	....	....	
Opiliones	....	....	....	....	....	....	....	....	13	....	....	....	
Araneae													
Saltigradae	....	....	....	....	....	....	....	....	15	3	....	....	
Citigradae	....	....	....	....	....	....	....	....	1	....	....	....	
Laterigradae	....	....	....	....	....	....	....	....	22	3	4	....	
Territelariae	....	....	2	....	....	....	....	....	1	....	....	....	
Tubitelariae	....	....	....	....	....	....	1	....	72	8	3	....	
Retitelariae	....	....	....	....	....	....	....	....	54	3	5	....	
Orbitelariae	....	....	....	....	....	....	....	....	17	12	3	....	

THE DOUBLE ROLE OF THE STING OF THE HONEY-BEE.*

Very important and highly interesting discoveries have recently been made in regard to a double role played by the sting of the honey-bee. These discoveries explain some hitherto inexplicable phenomena in the domestic economy of the ants. It is already known that the honey of our honey-bees, when mixed with a tincture of litmus, shows a distinct red color, or in other words has an acid reaction. It manifests this peculiarity because of the volatile formic acid which it contains. This admixed acid confers upon crude honey its preservative power. Honey which is purified by treatment with water under heat, or the so-called honey-syrup, spoils sooner, because the formic acid is volatilized. The honey of vicious swarms of bees is characterized by a tart taste and a pungent odor. This effect is produced by the formic acid, which is present in excess in the honey. Hitherto it has been entirely unknown in what way the substratum of this peculiarity of honey, the formic acid in the honey, could enter into this vomit from the honey-stomach of the workers. Only the most recent investigations have furnished us an explanation of this process. The sting of the bees is used not only for defense but quite principally serves the important purpose of contributing to the stored honey an antizymotic and antiseptic substance. The observation has recently been made that the bees in the hive, even when they are undisturbed, wipe off on the combs the minute drops of bee-poison (formic acid) which from time to time exude from the tip of their sting. And this excellent preservative medium is thus sooner or later contributed to the stored honey. The more excitable and the more ready to sting the bees are, the greater will be the quantity of formic acid which is added to the honey, and the admixture of which good honey needs. The praise which is so commonly lavished upon the Ligurian race of our honey bees, which is indisposed to sting—and such praise is still expressed at the peripatetic gatherings of German bee-masters — is therefore from a practical point of view a false praise. Now we understand also why the stingless honey-bees of South America collect little honey. It is well known that never more than a very small store of honey is found in felled trees inhabited by stingless *Melipona*. What should induce the *Melipona* to accumulate stores which they could not preserve?! They lack formic acid. Only three of the eighteen different known species of honey-bees of northern Brazil have a sting. A peculiar phenomenon in the life of certain ants has always been problematical but now it finds also its least forced explanation. It is well known that there are different grain-gathering species of ants. The

* Translated from an article entitled 'Ueber eine doppelrolle des stachels der honigbienen" in *Deutsch. amerikanische apotheker-zeitung*, 15 Jan. 1885, jahrg. 5, p. 664; there reprinted from "*Ind. blatter.*"

seeds of grasses and other plants are often preserved for years in their little magazines, without germinating. A very small red ant, which drags grains of wheat and oats into its dwellings, lives in India. These ants are so small, that eight or twelve of them have to drag on one grain with the greatest exertion. They travel in two separate ranks over smooth or rough ground, just as it comes, and even up and down steps, at the same regular pace. They often have to travel with their booty more than a thousand metres, to reach their communal store-house. The renowned investigator Moggridge repeatedly observed that when the ants were prevented from reaching their magazines of grain, the seeds began to sprout. The same was the case in abandoned magazines of grain. Hence the ants know how to prevent the sprouting of the grains, but the capacity for sprouting is not destroyed. The renowned English investigator John Lubbock, who communicates this and similar facts in his work entitled "Ants, bees and wasps," adds that it is not yet known in what way the ants prevent the sprouting of the collected grains. But now it is demonstrated that here also it is only the formic acid whose preservative influence goes so far that it can make seed incapable of germination for a determinate time or continuously.

It may be mentioned that we have also amongst us a species of ant which lives on seeds and stores these up. This is our *Lasius niger*, which carries seeds of *Viola* into its nests, and, as Wittmack has communicated recently to the Sitzungsberichte der gesellschaft naturforschender freunde zu Berlin, does the same with the seeds of *Veronica hederaefolia*.

Syke states in his account of an Indian ant, *Pheidole providens*, that this species collects a great store of grass-seeds. But he observed that the ants brought their store of grain into the open air to dry it after the monsoon storms. From this it appears that the preservative effect of the formic acid is destroyed by great moisture, and hence this drying process. So that amongst the bees the honey which is stored for winter use, and among the ants the stores of grain which serve for food, are preserved by one and the same fluid, formic acid.

EDITORIAL NOTE.

This same theory has been suggested many times by our most advanced American bee keepers. It has been hinted that this same formic acid was what made honey a poison to many people, and that the sharp sting of some honey, notably that from bass wood or linden, originated in this acid from the poison sack. If this is the correct explanation, it seems strange that the same kind of honey is always peculiar for greater or less acidity as the case may be. We often see bees with sting extended and tipped with a tiny drop of poison; but how do we know that this poison is certainly mingled with the honey? Is this any more than a guess? A. J. Cook.

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CAMBRIDGE, MASS., JAN.–MAR. 1885.

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PERMANENT MOUNTING OF TRACHEAE OF INSECTS.

I have succeeded in a very simple way in mounting permanently the tracheal system of insects. I dissect out the soft parts and spread them on a glass slide of the usual size; let them dry perfectly; then with pencil-brush give them a good coating of collodion, after which I melt a little hard, pure balsam in a test tube and put it on the object with a cover glass applied at once. This is, so far as I know, a new method. It is remarkable for its results. The intestines, the ganglia, and the brain are perfectly magnificent. The intestine makes thus one of the most beautiful objects for dark-ground illumination. The brain shows the most abundant ramifications of the trachea, especially in the immense parallel branches in the rods of the eyes. The ganglia can be floated on a cover glass, dried, and mounted in this way. The entire process is simple and easy, and gives the most satisfactory results. There are many points of histological interest in the brain which are thus demonstrated.

Lynn, Mass. *F. T. Hazlewood.*

PROCEEDINGS OF SOCIETIES.

ZOOLOGICAL SOCIETY OF LONDON.

19 JUNE 1883.— . . . Prof. E. Ray Lankester, F. R. S., read a memoir on the muscular and endoskeletal systems of *Limulus* and *Scorpio*. . . . These investigations seemed to confirm Prof. Lankester's previously expressed views as to the near affinity of these two forms, hitherto usually referred to different classes of the animal kingdom, and to justify the association of *Limulus* with the arachnida.

18 DEC. 1883.— . . . Dr. F. Leuthner read an abstract of a memoir which he had prepared on the *odontolabini*, a subfamily of the coleopterous family *lucanidae*, remarkable for the polymorphism of the males, while the females remained very similar. The males were stated to exhibit four very distinct phases of the development in their mandibles, which the author proposed to term "priodont," "amphiodont," "mesodont," and "telodont." These forms were strongly marked in some species, but in others were connected by insensible gradations, and had been treated by the earlier authors as distinct species. The second part of the memoir contained a monograph of the three known genera which constitute the group *odontolabini*. . . . Mr. J. Wood-Mason, F.Z.S., read a paper on the *embiidae*, a little-known family of insects, on the structure and habits of which he had succeeded in making some investigations during his recent residence in India. He came to the conclusion that the *embiidae* undoubtedly belong to the true orthoptera, and are one of the lowest terms of a series formed by the familiar *acridiodea*, *locustidae*, *gryllidae*, and *phasmatidae*.

1 APRIL 1884.— . . . Mr. F. D. Godman, F.R.S., read a paper containing an account of the lepidoptera collected by the late Mr. W. A. Forbes on the banks of the Lower Niger, the rhopalocera being described by Messrs. F. D. Godman and O. Salvin, and the heterocera by Mr. H. Druce. The species

of butterflies were fifty in number, and comprised representatives of all the families of rhopalocera hitherto known from tropical Africa, except the *erycinidae*, a group but feebly developed in this region.— Selected from *Zoologischer anzeiger*.

LINNEAN SOCIETY OF LONDON.

21 FEB. 1884. — Mr. R. Miller Christy brought before the notice of the society a series of lepidoptera, hymenoptera, etc., captured by him in Manitoba, some of the humble-bees being supposed new to science.

20 MARCH 1884. — In illustration of his paper—"A contribution to the knowledge of the genus *Anaphe* Walker"—Lord Walsingham exhibited a large and remarkable nest of a congregating moth, a species of the genus, from Natal. It contained a packed mass of cocoons, specimens of the larvae and of the mature insect; there likewise was shown a living example of a dipterous parasite which had emerged from the moth eggs....

3 APRIL 1884.—... A paper was read by Mr. Francis J. Briant, On the anatomy and functions of the tongue of the bee (worker). The author, after referring to the structures of the more conspicuous parts of the endoskeleton and relations of the tongue thereto, treats specially of the manner in which the bee takes up the honey by its tongue. It appears that upon the nature and function of the organ in question authorities are by no means agreed. Kirby and Spence, supported by Huxley and partly Newport, aver that the bee simply laps up its food; while Hermann Müller and others rather attribute the action as due to the terminal whorl of hairs to which the honey adheres and therefrom is withdrawn inwards. The author of the paper on the other hand (from experiment and otherwise) is inclined to the view that the honey is drawn into the mouth through the inside of the tongue by means of a complicated pumping action of the organ itself aided by the closely contiguous parts.

6 Nov. 1884.—Mr. R. A. Rolfe exhibited and made remarks on examples of British oak galls produced by cynipidan insects of the genus *Neuroterus*, collected by him chiefly at Kew Gardens. He admitted that, as a rule, the plan and detail of the galls depend on the nature of the irritating fluid deposited by the insect; but at the same time the various species of oak have special influence in determining color and often size of the galls.

20 Nov. 1884.—A paper was read, entitled "Notes on the habits of some Australian hymenoptera aculeata" by H. L. Roth. Therein he states that the wasps of the genus *Pelopoeus* (*P. laetus*) build their nests on the walls, ceilings, legs of chairs, under tables, in cupboards, vases, between pictures and the walls, on curtains and in all sorts of crevices in the house, or on the roof. No place is safe from their intrusion. When a cell is completed the wasp goes in search of spiders, and seizing these, packs their half dead bodies in the cell, lays an egg and closes the cell-top. Then afterwards rows of cells are added to the primary one and dealt with in the same fashion; generally finishing with a streaked coating of mud, to deceive as to the real contents beneath. Of the Australian ants *Formica rufinigra* is both numerous, bold and destructive. They destroy the webs of certain caterpillars and drive them out, to fall a prey to a host of attendant warrior ants.

Mr. F. M. Campbell exhibited a dragon fly caught in September on the left bank of the Dordogne from a flight of dragon flies (*odonata*) which were taking a southeasterly direction; numbers were observed passing continuously for an hour and a half. He also drew attention to the steady progressive movement of a sphingid moth when placed on its back.— Selected from reports by J. Murie in *Zoologischer anzeiger*.

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard: S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Anderson, Joseph, *jr.* Urticating properties of lepidoptera. (Entomologist, Feb. 1885, v. 18, p. 43-45.)

Discussion of stinging hairs of larvae of *bombycidae;* quotation of the part of G: Dimmock's "On some glands which open externally on insects" (Psyche, Sep.-Oct. 1882 [1 Mar. 1884], v. 3, p. 387-401) [Rec., 2985] which pertains to this subject. *G: D.* (3675)

Anderson, Joseph, *jr.* The urticating properties of the hairs of some lepidoptera. (Entomologist, Dec. 1884, v. 17, p. 275-276.)

Reports that the imagos as well as the larvae of *Liparis* possess urticating properties, and discusses the probable causes. *G: D.* (3676)

Balding, G: Urticating properties of lepidoptera. (Entomologist, Feb. 1885, v. 18, p. 41-43.)

Discusses cause of urtication produced by the larvae of certain *bombycidae;* quotes portions of G: Dimmock's "On some glands which open externally on insects" (Psyche, Sep.-Oct. 1882 [1 Mar. 1884], v. 3, p. 387-401) [Rec., 2985]. *G: D.* (3677)

[**Bertkau**, Philipp.] Duftapparat an schmetterlingsbeinen. ("Kölnische zeitung"...) (Entom. nachrichten, 1 Sept. 1879, jahrg. 5, p. 223-224.)

Abstract, by E: Burgess. (Psyche, March [1 May] 1880, v. 3, p. 32.)

Describes glandular apparatus on the posterior tibiae of *hepialus hecta,* to be used in connection with another apparatus on the first abdominal segment to distribute an odor for sexual purposes. *G: D.* (3678)

Bessey, C: Edwin. A new species of insect-destroying fungus. (Amer. nat, Dec. [28 Nov.] 1883, v. 17, p. 1280-1281.)

Reprint in H. Osborn's "Notes on locust parasite" (Bull. Iowa agric. coll., Aug. 1884, no. 2), p. 84-85.

Describes the *tarichium* stage of *entomophthora calopteni,* a new species of fungus parasitic in *caloptenus differentialis.* *G: D.* (3679)

Briggs, T. R. Archer. On the fertilization of the primrose (*primula vulgaris.* Huds.). (Journal of botany, 1870, v. 8, p. 190-191.)

The writer does not agree with C: Darwin in his "On the specific differences between *primula veris,* Br. Fl., *p. vulgaris,* Br. Fl., and *p. elatior,* Jacq...." (Journ. Linn. Soc., Bot., 19 Mar. 1868, v. 10, p. 437-454) [Rec., 2377] in believing that *primula vulgaris* is fertilized almost exclusively by moths. He finds the flowers visited by *anthophora acervorum, andrena gwynana, gonepteryx rhamni,* and *bombylius medius.* *W: T.* (3680)

Brongniart, C: Sur un gigantesque neuroptère, provenant des terrains houillers de Commentry (Allier). (Comptes-rendus Acad. sci. France, 31 Mar. 1884, v. 98, p. 832-833.)

Brief account of the discovery of *dictyoneura goldenbergi,* and notice of its affinities with other fossil orthoptera. *G: D.* (3681)

Camerano, Lorenzo. Ricerche intorno alla struttura dei peli-ventose dei tarsi dei coleotteri. Laboratorio del Regio museo zoologico di Torino. (Atti Accad. sci. di Torino, 1879, v. 14, p. 1148-1164.)

Separate. Torino, 1879. t.-p. cover + 20 p., 2 pl., 24 × 16, t 15 × 9.

Notice. (BERTKAU, P. Bericht . . . der entom. f. 1879, 1881, p. 260.)

Describes and figures the tarsal hairs of species chosen from twelve families of coleoptera. *G: D.* (3682)

Candèze, Ernest. Les moyens d'attaque et de défense chez les insectes. Lecture faite à la séance publique annuelle de la classe des sciences de l'Académie royale du 16 décembre 1874. (Bull. Acad. roy.... Belg., 1874, s. 2, v. 38, p. 787-816.)

Separate. Bruxelles, *F. Hayez,* 1874. t.-p. cover, 32 p., 22 × 15, t 15 × 8.7.

Notice. (Naturaliste canadien, Mar. 1875, v. 7, p. 92-93.) [Rec., 764 *b.*]

Popular lecture on the means of attack and of defense employed by insects. *G: D.* (3683)

Carlet, G. Sur les muscles de l'abdomen de l'abeille. (Comptes-rendus Acad. sci. France, 24 Mch. 1884, v. 98, p. 758-759.)

Nomenclature proposed for the abdominal muscles of *apis;* these muscles, with the exception of the aliform ones which aid circulation, have respiratory movements as their function; these movements take place in the direction of all three diameters of the abdomen.

G: D. (3684)

Carlet, G. Sur le venin des hyménoptères et ses organes sécréteurs. (Comptes-rendus Acad. sci. France, 23 June 1884, v. 98, p. 1550-1551.)

Abstract. (Journ. Roy. micros. soc., Oct. 1884, s. 2, v. 4, p. 739.)

The poison of the sting of hymenoptera, altho acid, is the product of a mixture of secretions from two glands, one of which produces strongly acid, the other weak alkaline secretion; the presence of both these secretions is necessary for the toxic effect of the sting.

G: D. (3685)

Chambers, Vactor Tousey. On the changes that take place in the mouth-parts and legs of some leaf-mining lepidopterous larvae. (Amer. entom., Nov. 1880, v. 3, n. s., v. 1, p. 255-262, 316 cm., fig. 124-137, 139-144.)

Supplement, [by C: V. Riley], entitled "Mandible of *lithocolletis guttifinitella*." (*op. cit.*, Dec., p. 294, 7 cm., fig. 138.)

Description and figures of mouth-parts of larvae of several genera of *tineina;* description of changes that take place in these mouth-parts and in the legs, and application of the facts observed to the theory of evolution.

B: P. M. (3586)

Chambers, Vactor Tousey. Wandering habit of larvae belonging to the genus *bucculatrix.* (Amer. entom., Feb. 1880, v. 3, n. s., v. 1, p. 50, 9 cm.)

Larvae of *bucculatrix* have the habit of wandering away from their food plants, frequently, to pupate, so that finding the pupae on a plant is not evidence that such is the food-plant; cocoons of *b. pomifoliella* found on *sambucus; b. thuiella* and *b. ambrosiaeella* may not feed on *thuja* and *ambrosia* respectively.

B: P. M. (3687)

Chapman, A. W. On the preparatory stages of certain Florida butterflies. (Can. entom., Oct. 1879, v. 11, p. 189-193.)

Describes larva and pupa of *pamphila phyleus, p. brettus, p. accius, p. maculata, p. arpa, p. delaware,* larva of *p. palatka* and *eudamus proteus,* and egg of *p. brettus,* with notes on food-plants; introductory note and comparisons of these descriptions with those based on Abbot's figures, by W: H: Edwards.

B: P. M. (3688)

Chapman, I: Some observations on the hessian fly; written in the year 1797. (Memoirs Phil. soc. promot. agric., 1826, v. 5, p. 143-153.)

History of *cecidomyia destructor,* in Bucks co., Pa., from 1780 to 1790; its natural history and seasons; description of it in all stages; precautions against it.

B: P. M. (3689)

Cholodkowsky, N. Sur les vaisseaux de Malpighi chez les lépidoptères. (Comptes-rendus Acad. sci. France, 10 Mar. 1884, v. 98, p. 631-633.)

Tineola biselliella (? = *tinea pellionella*) and *tinea rusticella* have only two Malpighian vessels, while their larvae have four; this reduction of number of Malpighian vessels in the imago is regarded as a kind of periodic atavism.

G: D. (3690)

Clemens, Brackenridge. American microlepidoptera. (Proc. Entom. soc. Philad., Mar. 1863, v. 2, p. 314.)

Reprint. (CLEMENS, B. The *tineina* of North America . . . Stainton. Lond., 1872. p. 207-221.)

Re-describes the genera *coleophora, glyphipteryx, gracilaria, gelechia;* describes the new genus *marmara* and 16 new species of *tineina;* description of habits of imago of *strobisia levipedella* n. sp., of mines of larvae of *parectopa robiniella, marmara salictella, phyllocnistis liriodendronella* and *tischeria quercitella,* and larvae and larval habits of some of the species; discusses the species named *anacampsis robiniella* and *argyromiges pseudaciella* by Asa Fitch.

B: P. M. (3691)

Clemens, Brackenridge. American microlepidoptera. (Proc. Entom. soc. Philad., Aug. 1863, v. 2, p. 119-129.)

Reprint. (CLEMENS, B. The *tineina* of North America . . . Stainton. Lond., 1872. p. 222-236.)

Re-describes the genera *ypsolophus, depressaria, emicostoma?,* and *chauliodus?;* describes the new genera *holcocera, brachiloma* and *homosetia* (group of *tinea*), and 21 new species of *tineina;* gives synoptical table of 19 species of *gelechia;* remarks on larval habits of *depressaria.*

B: P. M. (3692)

Clemens, Brackenridge. Micro-lepidopterous larvae. Notes on a few species, the imagos of which are probably undescribed. (Proc. Entom. soc. Philad., Nov. 1861, v. 1, p. 75-87.)

Reprint. (CLEMENS, B. The *tineina* of North America . . . Stainton. Lond., 1872. p. 161-178.)

Remarks on the characteristic appearance of the mines of leaf-miners, and the ease and interest of rearing leaf-miners; directions for collecting, observing and rearing these insects; monthly calendar showing when the larvae mentioned should be sought; descriptions of mines and habits of larvae of 7 species of *coleophora,* 2 *lithocolletis,* 2 *aspidisca,* 14 *nepticula,* 1 *ornix,* 3 *catastega.*

B: P. M. (3693)

Clemens, Brackenridge. New American micro-lepidoptera. (Proc. Entom. soc. Philad., Jan. 1862, v. 1, p. 131-137.)

Reprint. (CLEMENS, B. The *tineina* of North America . . . Stainton. Lond., 1872. p. 179-188.)

Describes the genera *opostega, solenobia?, lyonetia, tenaga* n. g., *hybroma* n. g., and the new species *opostega albogalericlla, trichotaphe alacella, solenobia? walshella, nepticula fuscotibiella, n. bifasciella, n. platanella, lyonetia speculella, tenaga pomiliella, hybroma servulella, dysodia margaritana;* remarks on the larval habits of the *solenobia?* and those of a *phyllocnistis?; gelechia? flavocostella* is a *trichotaphe.* [The reprint omits the description of *dysodia margaritana.*]

B: P. M. (3694)

Clemens, Brackenridge. North American micro-lepidoptera. (Proc. Entom. soc. Philad., Mar. 1862, v. 1, p. 147-151.)
Reprint. (CLEMENS, B. The *tineina* of North America . . . Stainton. Lond., 1872. p. 189-194.)

Description of larva, pupa and mine of *bedellia somnulentella*, previously described by author as *b. stainton-ella* n. sp.; habits and affinities of larva and imago. Descriptions of mines of *nepticula platanella* and two other species of *nepticula* in leaves of *platanus;* descriptions of larvae of the two new species; directions for rearing leaf-mining larvae. *B: P. M.* (3695)

Clemens, Brackenridge. North American micro-lepidoptera. (Proc. Entom. soc. Philad., Mar. 1864, v. 2, p. 415-460.)
Reprint. (CLEMENS, B. The *tineina* of North America . . . Stainton. Lond., 1872. p. 237-256.)

Re-describes the genera *adela, dasycera; anesychia, elachista?;* describes the new genera *walshia, hamadryas, cycloplasis, wilsonia;* describes 3 new species of *tinei..a*, 3 of *tortricina* and *crambus inornatellus* n. sp., from Labrador, and 16 new *tineina* from United States; remarks on other species. [The reprint omits the descriptions of the *tortricina* and *crambus*.]
B: P. M. (3696)

Clemens, Brackenridge. North American micro-lepidoptera. (Proc. Entom. soc. Philad., Dec. 1864, v. 3, p. 505-520, fig. 1-5.)
Reprint of p. 505-508. (CLEMENS, B. The *tineina* of North America . . . Stainton. Lond., 1872. p. 257-263.)

Describes 5 new species of *tineina* and 25 new species of *tortricina*, with some re-descriptions and notes on habits; re-describes the genera *ditula?, ptycholoma?* and *steganoptycha?* (all *tortricina*), and figures the neuration of wings and structure of palpi of *anchylopera, ptycholoma?* and *steganoptycha?;* synopsis of the groups and list of species of *anchylopera*. [Only the portion relating to *tineina* is reprinted.]
B: P. M. (3697)

Clemens, Brackenridge. North American micro-lepidoptera. (Proc. Entom. soc. Philad., Sep. 1865, v. 5, p. 133-147, il.)
Reprint from p. 142-147. (CLEMENS, B. The *tineina* of North America . . . Stainton. Lond., 1872. p. 264-273, 1 fig.)

Describes 23 new species and the following 3 new genera of *tortricina*, viz: *leptoris, eurypt ychia, callimosema; exartema* = *sericoris;* re-describes the genus *batrachedra* and describes as new species *b. salicipomonella, bucculatrix trifasciella* and *incurvaria mediostriatella;* gives extensive notes, by B: D. Walsh, on the food-habits of the *batrachedra*, with description of larva; re-describes *gracilaria violacella* (re-named *g. desmodifoliella*); describes imago of *nepticula saginella*, with notes on the habits of this species and of *bucculatrix trifasciella;* lists and synoptical tables of the described species of *stigmonota, sericoris, lozotaenia, steganoptycha, gracilaria* and *nepticula;* figures neuration of wings and structure of palpi of *leptoris, callimosema* and *batrachedra*. [Only the portion on the *tineina* is reprinted.] B: D. Walsh states, in his "The joint worm" (Pract. entom., 27 Nov. 1865, v. 1), p. 11, that *eurypt ychia saligneana* was bred from a gall on *solidago*. *B: P. M.* (3698)

Clemens, Brackenridge. Notes on *thyridopteryx ephemeraeformis*. (Proc. Entom. soc. Philad., Nov. 1866, v. 6, p. 221-222.)
Extract. (CLEMENS, B. The *tineina* of North America . . . Stainton. Lond., 1872. p. 274.)

Discussion of the synonymy of "*sphinx ephemeraeformis* of Haworth" = *thyridopteryx ephemeraeformis;* reprint of Stephens' generic diagnosis of *thyridopteryx* (Ill. Brit. entom. . . . Haust., Lond., 1828, v. 1, p. 145).
B: P. M. (3699)

Comstock, J: H: The apple maggot. *Trypeta pomonella* Walsh. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 195-198, pl. 14.) (COMSTOCK, J: H: Report on insects for the year 1881 . . . 1882, p. 3-6, pl. 14.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 195-198 [135-138], pl. 14.)

Food-plants, ravages and geographical distribution of and means against *trypeta pomonella;* localities in which ravages occur; description and figures of larva, pupa and imago and of respiratory apparatus.
B: P. M. (3700)

Comstock, J: H: [Carnivorous habits of a pyralid moth.] (Can. entom., Oct. 1879. v. 11, p. 196.)

Carnivorous habits of [*dakruma coccidivora*].
B: P. M. (3701)

Comstock, J: H: [Habits of species of *retinia* injurious to pine trees.] (Can. entom., Sep. 1879, v. 11, p. 176.)

Food-habits of *retinia* [*frustrana*] and of *r.* [*rigidana*].
B: P. M. (3702)

Comstock, J: H: Lac insects. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 209-213, pl. 19; pl. 20, fig. 1.) (COMSTOCK, J: H: Report on insects for the year 1881 . . . 1882, p. 17-21, pl. 19; pl. 20, fig. 1.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 209-213 [149-153], pl. 19; pl. 20, fig. 1.)

Describes the generic characters of *carteria* and describes and figures *c. lacca, c. larreae* n. sp. and *c. mexicana* n. sp.; references to articles on *c. lacca*.
B: P. M. (3703)

Comstock, J: H: Ladybirds. *Coccinellidae*. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 204-206, pl. 18.) (COMSTOCK, J: H: Report on insects for the year 1881 . . . 1882, p. 12-14, pl. 18.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 204-206 [144-146], pl. 18.)

Habits of *coccinellidae;* descriptions and figures of larva, pupa and imago of *cycloneda abdominalis, c. sanguinea, chilocorus cacti* and *hippodamia ambigua*, and of imago of *cycloneda oculata, coccinella quinquenotata* var. *californica*, and *hippodamia convergens*.
B: P. M. (3704)

Comstock, J: H: Methods of destroying scale insects. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 206-209.) (COMSTOCK, J: H: Report on insects for the year 1881 . . . 1882, p. 14-17.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 206-209 [146-149].)

Introduces letters from S. F. Chapin and Matthew Cooke, to show the beneficial effect of the use of lye and whale-oil soap and sulphur as means against *coccidae* and *trombididae* on orchard trees, and the superiority of these substances to kerosene for the purpose; method of spraying trees and use of a "bamboo extension" for carrying spray into large trees. Preceded by an interjected critical review, by C: V. Riley. The "author's edition" of Comstock contains a reply to this review and the "author's edition" of Riley contains a rejoinder to this reply; both inserted on fly-slips.
B: P. M. (3705)

Comstock, J: H: On a new predaceous lepidopterous insect. (N. A. entom., Oct. 1879, v. 1, p. 25-29, pl. 4.)

Description and figures of egg, mature larva, pupa and imago of *dakruma coccidivora* n. sp., predatory on *pulvinaria innumerabilis;* description of newly hatched larva; habits and seasons of larva and imago; discussion of accounts of parasitic, inquilinous and predaceous lepidopterous larvae hitherto observed.
B: P. M. (3706)

Comstock, J: H: A new wax insect. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 213-214, pl. 20, fig. 2.) (COMSTOCK, J: H: Report on insects for the year 1881 . . . 1882, p. 21-22, pl. 20, fig. 2.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 213-214 [153-154], pl. 20, fig. 2.)

Description of *cerococcus* n. g. [*coccidae*] and *c. quercus* n. sp., from twigs of several species of *quercus;* description and figure of sacs of male and female and of body of female. *B: P. M.* (3707)

Comstock, J: H: Note on the structure of mealy bugs. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 214.) (COMSTOCK, J: H: Report on insects for the year 1881 . . . 1882, p. 22.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 214 [154].)

Position of opening of oviduct in *dactylopius*, and presumably in other *coccinae;* anal ring improperly called ano-genital ring; position and homology of dorsal secretory openings. *B: P. M.* (3708)

Comstock, J: H: The ocellate leaf gall of red maple. *Sciara ocellaris* O. S. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 202-204, pl. 17.) (COMSTOCK, J: H: Report on insects for the year 1881 . . . 1882, p. 10-12, pl. 17.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 202-204 [142-144], pl. 17.)

Habits, ravages and synonymy of *sciara ocellaris;* description and figures of gall, larva and male imago; figures of cocoon and pupa-skin; habits of *sciara* and of *s. tilicola;* description of gall of *s. tilicola.*
B: P. M. (3709)

Comstock, J: H: [Plan of formation of the biological collection of insects in the Department of agriculture at Washington.] (Can. entom., Nov. 1879, v. 11, p. 202-203.)

Response of Comstock to requests for information; subject expressed by title. Remarks of S: H. Scudder on the importance of the formation of a national collection at Washington. *B: P. M.* (3710)

Comstock, J: H: The pretty pomace-fly. *Drosophila amoena* Loew. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 201-202, pl. 16.) (COMSTOCK, J: H: Report on insects for the year 1881 . . . 1882, p. 9-10, pl. 16.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 201-202 [141-142], pl. 16.)

Habits and period of development of and means against *drosophila amoena;* description and figures of larva, pupa and imago and of respiratory apparatus.
B: P. M. (3711)

Comstock, J: H: Report on miscellaneous insects. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 195-214, pl. 14-20.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 195-214 [135-154], pl. 14-20.)

Separate, entitled "Report on insects for the year 1881. Author's edition. From the annual report of the Department of agriculture for the year 1881." Wash., 1882. t.-p. cover + t.-p., 22 p., pl. 14-20, 23 × 15.

Consists of the following sub-chapters, all cited under the name of J: H: Comstock:—The apple maggot. *Trypeta pomonella* Walsh [Rec., 3700].—The vine-loving pomace-fly. *Drosophila ampelophila* Loew [Rec., 3714].—The pretty pomace-fly. *Drosophila amoena* Loew [Rec., 3711].—The ocellate leaf gall of red maple. *Sciara ocellaris* O. S. [Rec., 3709].—Ladybirds. *Coccinellidae* [Rec., 3704].—Methods of destroying scale insects [Rec., 3705].—Lac insects [Rec., 3703].—A new wax insect [Rec., 3707].—Note on the structure of mealy bugs [Rec., 3708]. *B: P. M.* (3712)

Comstock, J: H: [Spread of the Colorado potato beetle into Manitoba.] (Can. entom., Oct. 1879, v. 11, p. 196.)

Doryphora decemlineata found in Manitoba in 1879, its most northern habitat so far known.
B: P. M. (3713)

Comstock, J: H: The vine-loving pomace-fly. *Drosophila ampelophila* Loew. (Rept. [U. S.] commiss. agric., for 1881 and 1882, 1882 [Jan. 1883], p. 198-201, pl. 15.) (COMSTOCK, J: H: Report on insects for the year 1881 . . . 1882, p. 6-9, pl. 15.) (RILEY, C: V. Report of the entomologist . . . [1 Dec.] 1882, p. 198-201 [138-141], pl. 15.)

Habits and ravages and period of development of and means against *drosophila ampelophila;* description and figures of egg, larva, pupa and imago and of respiratory apparatus. *B: P. M.* (3714)

[Connecticut board of agriculture.] Poultry. (4th ann. rept. secr. Conn. board agric., for 1869-1870, 1870, p. 9-45.)

Communications and discussion on poultry-raising; includes, on p. 12-13, 18, 22, 26, 27, 30-36, 41-44, remarks on insects and worms injurious to fowl, and means against them, and on the usefulness of fowl as destroyers of insects, by T. S. Gold, P. M. Augur, W: H. Brewer, H. S. Collins, J. N. Blakeslee, W. A. Browning, N. Cressy, W: Plumb, — Hunt, J. M. Hubbard.
B: P. M. (3715)

Connecticut board of agriculture — *Entomologist, 1872* (Sidney Irving Smith). Address of the state entomologist [with discussion]. (5th ann. rept. secr. Conn. board agric., for 1871-72, 1872, p. 203-234.)
Vote of thanks for the address. (*op. cit.*, p. 235.)

Ravages and usefulness and abundance and disappearances of and valid and invalid means against insects; importance to the farmer of a knowledge of entomology; special account of *sphenophorus sculptilis* (called *s. zeae*), *s. robustus*, *bruchus obsoletus*, *lema trilineata* and (by J. S. Gould) *cecidomyia tritici*, with briefer mention of numerous other insects and of means against insects, especially the use of dust or powders to kill moist-bodied insects, and the influence of parasites; discussion participated in by — Riggs, W. W. White, S. W. Johnson, — Danielson, J. S. Gould, and author. *B. P. M.* (3716)

Connecticut board of agriculture — *Secretary*. 4th annual report . . . 1869-70. Printed by order of the legislature. Hartford, 1870. 423 p., [9 pl.], 24 × 15, il.

Contains a remark on means against *dermatodectes ovis*, on p. 126, and articles of entomological contents recorded under the following titles: — CONNECTICUT BOARD OF AGRICULTURE.] Poultry [Rec., 3715], p. 9-45. —VERRILL, A. E. The external parasites of domestic animals: their effects and remedies [Rec., 3568], p. 72-122. —VERRILL, A. E. The internal parasites of domestic animals; their effects and remedies [Rec., 3569], p. 162-256. *B: P. M.* (3717)

Connecticut board of agriculture—*Secretary*. 5th annual report . . . 1871-72. Printed by order of the legislature. Hartford, 1872. 386 p., [1] pl., 24 × 15.

Contains a minute (p. 10) of the election of Sidney Irving Smith to be entomologist of the Connecticut board of agriculture, 16 Aug. 1871, and (p. 13) of an appropriation of $200 to him, for investigations of insects; also remarks (p. 177, 178, 182, 294) on *macrosila carolina* and cut-worms as injuring tobacco plants, and means against them; and articles of entomological contents recorded under the following titles: — CONNECTICUT BOARD OF AGRICULTURE—*Entomologist, 1872*. Address of the state entomologist [Rec., 3716], p. 203-234, 235. — VERRILL, A. E. Additional observations on the parasites of man and domestic animals [Rec., 3566], p. 321-342. *B: P. M.* (3718)

Coquillett, Daniel W: Description of noctuid larvae. (N. A. entom., Jan. 1880, v. 1, p. 52.)

Describes larvae of *telesilla cinereola*, *crambodes talidiformis* and *adipsophanes miscellus*.
B. P. M. (3719)

Darwin, C: "Ueber die einrichtungen zur befruchtung britischer und ausländischer orchideen durch insecten, und über die günstigen erfolge der wechselbefruchtung". Stuttgart, 1862."

Germ. tr., by H. G. Bronn, of Darwin's "On the various contrivances by which British and foreign orchids are fertilized by insects" . . . [Rec., 2378].
W: T. (3720)

Dewitz, Hermann. Ueber das durch die foramina repugnatoria entleerte sekret bei *glomeris*. (Biolog. centralbl., June 1884, bd. 4, p. 202-203.)

Discusses the function of the adhesive secretion of the foramina repugnatoria which in *glomeris* are unpaired along the middle line of the dorsum.
G: D. (3721)

Doppelrolle des stachels der honigbienen (Ueber eine). Deutsch-amer. apothekerzeitung, 15 Jan. 1885, jahrg. 5, p. 664, 46 cm.)
Engl. tr., by B: P. Mann, entitled "The double role of the sting of the honey-bee." (Psyche, Jan.-Mar. 1885, v. 4, p. 245-246.)

From "*Ind. blatter.*" Remarks on the function of the sting of *apis mellifica* as introducing formic acid into the honey stored in cells, and on the preservative action of the formic acid upon honey. *B: P. M.* (3722)

Emerton, James H: New England spiders of the family *theridiidae*. (Trans. Conn. acad. arts and sciences, 1884, v. 6, p. 1-86, pl. 1-24.)
Separate. [New Haven, Conn., 1882.] t.-p. cover, p. 1-86, pl. 1-24. 25 × 15, t 18 × 10.5.

External anatomy of the *theridiidae*, and literature of New England species; descriptions of 134 New England species, with notes on localities of capture and on habits, and with numerous figures; describes 85 new species belonging to the genera *theridium*, *mimetus*, *steatoda*, *euryopsis*, *ulesanis*, *pholcomma*, *ceratinella*, *cornicularia*, *lophomma*, *lophocarenum*, *tmeticus*, *erigone*, *linyphia*, *diplostyla*, *bathyphantes*, *bolyphantes* and *microneta*, and to the new genera *ceratinopsis*, *grammonota*, and *spiropalpus*; a new genus, *theridula*, was made to include *theridion sphaerula* Hentz and the European *theridion gonygaster* Simon. *G: D.* (3723)

Fletcher, James. [Correspondence.] (Can. entom., Feb. [18 Mar.] 1883, v. 15, p. 40.)

Rev. of T: W. Fyles' "Notes on a gall mite of the nettle tree" . . . (*op. cit.*, Oct. [14 Dec.] 1882, v. 14, p. 198-199) [Rec., 3727]; identification, as *psylla celtidis-mamma*, of the insect described in Fyles' article, and remarks on the gall, and on the geographical distribution of *celtis occidentalis* in Canada. [For a reply to this review, see T: W. Fyles' "The parasite of *phylloxera vastatrix*" . . . (*op. cit.*, [26] May 1883 [Rec., 3728]), p. 84.] *B: P. M.* (3724)

F[ournier?], E[ug.]. [Rev. of] DARWIN, C: On the various contrivances by which British and foreign orchids are fertilized by insects, and on the good effects of intercrossing. . . . (Bull. Soc. bot. de France, Aug. 1862, v. 9, p. 243-246.) *W. T.* (3725)

Fyles, T: W. Description of a dipterous parasite of *phylloxera vastatrix*. (Can. entom., Dec. 1882 [29 Jan. 1883], v. 14, p. 237-239, fig. 25.)

Crit. rev. in C: V. Riley's "Dipterous enemies of the *phylloxera vastatrix*" (*op. cit.*, Feb. [18 Mch.] 1883, v. 15, p. 39).

Description and figures of larva, pupa and imago of *diplosis? grassator* n. sp.; account, by W: Saunders, of parasitism of the larva of this insect in leaf-galls of *phylloxera vitifoliae*. *B: P. M.* (3726)

Fyles, T: W. Notes on a gall mite of the nettle tree, *celtis occidentalis*. (Can. entom., Oct. [14 Dec.] 1882, v. 14, p. 198-199.)

Rev., by J. Fletcher, entitled "[Correspondence]." (*op. cit.*, Feb. [9 Mar.] 1883, v. 15, p. 40.)

Reply to Fletcher's rev., in author's "The parasite of *phylloxera vastatrix*" . . . (*op. cit.*, [26] May 1883, v. 15), p. 84.

Rev. in C: V. Riley's "Hackberry psyllid galls" (*op. cit.*, Aug. [1 Sep.] 1883, v. 15, p. 157-159, fig. 6-7).

Description of gall and of immature and mature stages of an unnamed "mite" [later determined as *psylla celtidis-mamma*]. *B: P. M.* (3727)

Fyles, T: W. The parasite of *phylloxera vastatrix*, and the gall insect of the nettle tree. (Can. entom., [26] May 1883, v. 15, p. 83-84.)

Crit. rev. in C: V. Riley's "Hackberry psyllid galls" (*op. cit.*, Aug. [5 Sep.] 1883, p. 157-159, fig. 6-7).

Communicates notes by H. A. Hagen on the insects described as *diplosis? grassator* in author's "Description of a dipterous parasite of *phyllovera vastatrix*" (*op. cit.*, Dec. 1882 [20 Jan. 1883], v. 14, p. 237-230, fig. 25) [Rec., 3725], and on the "gall-mite" described in author's "Notes on a gall mite of the nettle tree, *celtis occidentalis*" (*op. cit.*, Oct. [14 Dec.] 1882, v. 14, p. 198-199) [Rec., 3727]; the former insect is a cecidomyid, but not certainly a *diplosis;* the latter is identified as *psylla venusta* [later determined to be *pachypsylla celtidis-mamma*]; reply to J. Fletcher's "[Correspondence]" (*op. cit.*, Feb. [18 Mar.] 1883, v. 15, p. 40) [Rec., 3724], stating that *celtis occidentalis* occurs in Vaudreuil co., Quebec, but author has not met with it at Cowansville, Missisquoi co., and criticising the orthography of the term *celtidis*. *B: P. M.* (3728)

Jaworowski, Anton. Über die entwicklung des rückengefässes und speciell der musculatur bei *chironomus* und einigen anderen insecten. (Sitzungber. d. k. akad. d. wissensch. Wien. 1879. v. 80, pt. 1, p. 238-258, pl. 1-5.)

Separate. [Wien, 1879.] t.-p.cover, 20 p., 5 pl., 25 × 16. t 17.5 × 10.

Abstract, by P. Mayer. (Zool. jahresber. f. 1880, 1881, abtheil. 2, p. 107.)

Abstract. (BERTKAU, P. Bericht . . . der entom. f. 1879, 1881, p. 115.)

Literature (16 titles); the main conclusions are that "to each nucleus on the contractile wall of the dorsal vessel belongs a muscle-cell, each ring-muscle consists of two lateral cells which are only partly grown together in the median line, parts of the muscle-cells serve as valves." *G: D.* (3729)

Keyserling, Eugen. Neue spinnen aus Amerika. [1.] (Verhandl. k.-k. zool.-bot. gesells. in Wien, 1879, bd. 29; Abh., p. 293-350, pl. 4.)

Includes descriptions of *taczanowskia, castianeira* and *stenoctenus*, (3 new genera of *araneina*); and of *epeira punctillata, e. baltimorensis* and *tetragnatha illinoiensis* (3 new species from North America [United States]); re-describes *cyrtarachne cornigera, filistata capitata* and *f. hibernalis*, from southern United States. *G: D.* (3730)

Keyserling, Eugen. Neue spinnen aus Amerika. **2.** (Verhandl. k.-k. zool.-bot. gesells. in Wien, 1880, bd. 30; Abh., p. 547-582, pl. 16.)

Advance notice. (Amer. nat., June [21 May] 1880, v. 14, p. 468.)

Notice. (Amer. nat., Oct. [21 Sep.] 1880, v. 14, p. 740.)

Includes descriptions of *pronous* and *eurymachus* (2 new genera of *araneina*) and of *epeira praedrepida* and *dictyna sedentaria*, (2 new species from North America [United States]); re-describes *meta argyra* from Antilles, Cayenne, and Mexico. *G: D.* (3731)

Keyserling, Eugen. Neue spinnen aus Amerika. **3.** (Verhandl. k.-k. zool.-bot. gesells. in Wien, 1881, bd. 31; Abh., p. 269-314, pl. 11.)

Describes 30 new species of *araneina;* includes descriptions of *axilia, cyrtognatha* and *liocranoides* (3 new genera), and of *epeira cavatica, caelotes juvenilis* and *liocranoides unicolor* (from caves of Ky.); *dictyna volupis, d. volucripes, xysticus vernilis, x. ferox ulus, misumena importuna, thomisus bigibbosus*, and *philodromus lentiginosus* (from United States); and *selenops insularis* (from Porto Rico, W. I.). *G: D.* (3732)

Keyserling, Eugen. Neue spinnen aus Amerika. **4.** (Verhandl. k.-k. zool.-bot. gesells. in Wien, 1882, bd. 32; Abh., p. 195-226, pl. 15.)

Describes *segestrioides*, a new genus of *araneina, pachygnatha tristriata*, from "Boston," many new species of *araneina* from South America, and some from "Colorado" [? N. A.]. *G: D.* (3733)

Klemensiewicz, Stanislaus. Zur näheren kenntniss der hautdrüsen bei den raupen und bei *malachius*. (Verhandl. d. k.-k. zool.-bot. gesells. in Wien, 1882, bd. 32; Abhandl., p. 459-474, pl. 21-22.)

Abstract, by C. S. M[inot], entitled, Epidermal glands of caterpillars and *malachius*. (Science, 9 Nov. 1883, v. 2, p. 632, 17 cm.)

Literature (10 titles); description and figures of the external glands of the larvae of *liparis dispar, leucoma salicis, porthesia auriflua, papilio machaon, harpyia vinula* and *vanessa io*, and of the evaginable glands of the imago of *malachius;* mention (on his own or others' authority) of glands in larvae of *orgyia gonostigma, o. fascelina, liparis detrita, l. rubea, papilio asterias, p. podalirius, thais polyxena, doritis apollo, d. mnemosyne;* in larvae of all European species of *vanessa, melitaea* and *argynnis;* and in larvae of *bryophila*, most *cucullia, hubrostola, cleophana linariae, aporia crataegi*, many *satyridae, apl cta nebulosa, leucania straminea, l. hispanica* and *l. nonagrioides;* mention, on authority of Laboulbène, of evaginable glands on imago of *anthocomus equestris* and *cbaeus thoracicus*. *G: D.* (3734)

Künckel d'Herculais, Jules. Recherches morphologiques et zoologiques sur le système nerveux des insectes diptères. (Comptes-rendus Acad. sci. France, 1 Sept. 1879, v. 89, p. 491-494.)

Notice. (Month. journ. sci., Oct. 1879, s. 3, v. 1, p. 703.)

Abstract, by P. Mayer. (Zool. jahresber. f. 1879, 1880, p. 483.)

Abstract, by E: Burgess. (Psyche, March [1 May] 1880, v. 3, p. 39.)

General considerations on the nervous system of diptera, and on its application to their classification. *G: D* (3735)

Künstler, J. Sur une forme aberrante du phylum *sporozoa*. (Comptes-rendus Acad. sci. France, 10 Mar. 1884, v. 98, p. 633-634.)

Peculiarities and development of a species of gregarina parasitic in the intestinal canal of *periplaneta americana* [corr.]. *G: D.* (3736)

Laboulbène, Alexandre. Sur les différences sexuelles du *coraebus bifasciatus* et sur les pretendus œufs de cet insecte coléoptère nuisible au chêne vert. (Comptes-rendus Acad. sci. France, 25 Feb. 1884, v. 98, p. 539-541.)

Notes on the anatomy of the genitalia, and on the supposed eggs of *coraebus bifasciatus* which were found to be in reality the expanded abdomens of some species of acarid (near *tyroglyphus*); the ovoid abdomens of these mites contained eggs, and called to mind the abdomen of *pulex penetrans*. *G: D.* (3737)

McLachlan, Robert. *Eucalyptus* galls. (Entom. mo. mag., Dec. 1880, v. 17, p. 145-147, 2 fig.)

Crit. rev., [by C: V. Riley], entitled "Galls on *eucalyptus*." (Amer. nat., May [16 Apr.] 1881, v. 15) (Riley, C: V. Entomology . . . [May 1881]) p. 402.

Description and figures of galls, supposed to be dipterous, on *eucalyptus gracilis*, and of galls, supposed to be lepidopterous (pyralid) on a species of *eucalyptus*, in Australia. *B: P. M.* (3738)

Muellenhoff, K. Die bedeutung der ameisensäure im honig. (Deutsch-amer. apothzeitung, 1 Nov. 1884, jahrg. 5, p. 494-495, 32 cm.)

Abstract of a paper read before 57th assembly of German naturalists and doctors, at Magdeburg, Sept. 1884; Honey, when thus sealed in the comb, is preserved by formic acid [CH_2O_2] from the sting of the bee, and the bee-keeper can preserve honey that has not been sealed in comb by adding this acid; price of the acid, and amount of it required; consideration of the changes which formic acid produces in honey. *G: D.* (3739)

Müller, Fritz. "Blumen der luft." (Kosmos, May 1878, bd. 3, p. 187, 10 cm.)

Note on the agreeable odor of the male of *papilio grayi*. *G: D.* (3740)

Müller, Hermann. "Asa Gray. Darwin's werk über die wirkungen der kreuz und selbst-befruchtung im pflanzenreiche." (Bot. jahresbericht . . . Just, 1877, v. 5, p. 743, 5 cm.)

Notice of Asa Gray's "Fertilization of orchids through the agency of insects" (Amer. journ. sci. and arts, 1862, v. 84, s. 2, v. 34: July, p. 138-144; Nov., p. 420-429) [Rec., 2410]. *W: T.* (3741)

Müller, Hermann. Ueber die besonderen beziehungen zwischen pflanzen und insecten, welche sich auf inseln darbieten. (Bot. jahresbericht . . . Just, 1876, v. 4, p. 941-942.)

Rev. of A. R. Wallace's "President's address" of the British association for the advancement of science—[46th meeting]—Glasgow meeting, 1876—Section of biology [Rec., 2362]. *W: T.* (3742)

Müller, Hermann. Darwin's werk: "Ueber die wirkungen der kreuzung und selbstbefruchtung im pflanzenreich" und seine bedeutung für unser verständniss der blumenwelt. (Kosmos, Apr. 1877, v. 1, p. 57-67.)

Rev. of C: Darwin's "The effects of cross and self-fertilization in the vegetable kingdom" [Rec., 2369]. *W: T.* (3743)

Müller, Hermann. Die wirkungen der kreuzung und selbstbefruchtung im pflanzenreiche. (Bot. jahresbericht . . . Just, 1876, v. 4, p. 936-938.)

Rev. of C: Darwin's "The effects of cross and self-fertilization in the vegetable kingdom" [Rec., 2369]. *W: T.* (3744)

Müller, Wilhelm. Ueber einige im wasser lebende schmetterlingsraupen Brasiliens. (Arch. f. naturgesch., 1884, jahrg. 50, heft 2, p. 194-212, pl. 14.)

Describes and figures the aquatic larva of *cataclysta pyropalis*, a Brazilian pyralid, with especial reference to the anatomy of its respiratory system, in which oxygenation takes place entirely by tracheal gills; describes the larval case, and the pupa which has two pairs of open stigmata; explains the building and structure of the aquatic pupal case, and how pupal respiration is possible in it; the larva never leaves its case, feeds upon unicellular algae, and lives with its dorsum toward the stone to which the larval case is attached, having its ventral surface dark colored and its dorsal surface light, while the reverse of this coloration is found in the pupal state; notes on larvae of other species of the genus *cataclysta*. *G: D.* (3745)

Osborn, Herbert. The ash saw fly: *selandria barda* Say. (Bull. Iowa agric. coll., Aug. 1884, no. 2, p. 80-83, pl. 3, fig. 9.)

Partial life history, habits and parasites of and means against *selandria barda*, injurious to *fraxinus*; eggs and larvae described. *G: D.* (3746)

Osborn, Herbert. The corn root worm: *diabrotica longicornis*. (Bull. Iowa agric. coll., Aug. 1884, no. 2, p. 61-69, pl. 2.)

Life history of *diabrotica longicornis*; extent of its injuries to corn (*zea mays*); much of the account is stated to be copied from a report by Prof. S. A. Forbes. *G: D.* (3747)

Osborn, Herbert. An epidemic disease of *caloptenus differentialis*. (Amer. nat., Dec. [28 Nov.] 1883, v. 17) (RILEY, C: V. Entomology . . . [Dec. 1883]), p. 1286-1287.
Reprint, and crit. rev. of Riley's note, in author's "Notes on locust parasite" (Bull. Iowa agric. coll., Aug. 1884, no. 2, p. 83-86).

Notice of *entomophthora calopteni*, a fungus parasitic in *caloptenus differentialis*. [A note by C: V. Riley follows, in which he suspects "that the *entomophthora* is a result rather than a cause of disease and debility in this case."]. *G: D.* (3748)

Osborn, Herbert. External parasites of domestic animals. (Bull. Iowa agric. coll., Aug. 1884, no. 2, p. 69-79.)

General notes on external parasites of vertebrates; brief descriptive and other notes on certain species of *pediculidae*, *mallophaga*, *sarcoptidae* and *ixodidae*; remedies for different kinds of parasites. *G: D.* (3749)

Osborn, Herbert. Gall and blister mites. (Bull. Iowa agric. coll., Aug. 1884, no. 2, p. 54-61, pl. 1.)

Reprint, with a few alterations and additions, of author's "Leaf and gall mites" (Trans. Iowa state hortic. soc., 1883, v. 18, p. 127-135) [Rec., 3753]. *G: D.* (3750)

Osborn, Herbert. Insecticides and their application. (Bull. Iowa agric. coll., Aug. 1884, no. 2, p. 105-107.)

Brief popular account of the more commonly used insecticides and how to use them. *G: D.* (3751)

Osborn, Herbert. Insects of the orchard. (Bull. Iowa agric. coll., Aug. 1884, no. 2, p. 87-97.)

Notes on habits and ravages of 27 species of rhynchota known to infest orchards, with bibliographical references "to the works that contain the principal notes on each species." *G: D.* (3752)

Osborn, Herbert. Leaf and gall mites. (Trans. Iowa state hortic. soc., 1883, v. 18, p. 127-135.)
Reprint, with slight changes, entitled "Gall and blister mites." (Bull. Iowa agric. coll., Aug. 1884, no. 2, p. 54-61, pl. 1.)

A popular account of the habits and life-history of the *phytoptidae*; especial mention of *phytoptus pyri* and *ph. quadripes*, and of species on *ulmus*, *fraxinus* and *negundo*. *G: D.* (3753)

Osborn, Herbert. Notes on locust parasite. (Bull. Iowa agric. coll., Aug. 1884, no. 2, p. 83-86.)

Reprint of author's "An epidemic disease of *caloptenus differentialis*" [with Riley's note] (Amer. nat., Dec. [28 Nov.] 1883, v. 17, p. 1286-1287) [Rec., 3748], and of C: E. Bessey's "A new species of insect-destroying fungus" (*op. cit.*, p. 1280-1281) [Rec., 3679], with addition of further notes showing that *entomophthora calopteni* is a true parasite of the *caloptenus*. [Contains numerous typographical errors, not in the original articles.] *G: D.* (3754)

Osborn, Herbert. The pine louse. (Bull. Iowa agric. coll., Aug. 1884, no. 2, p. 97-105, pl. 3, fig. 10.)

Bibliography, habits, life-history, and arthropod enemies of *chermes pinicorticis*. This paper is an amplification of the author's "On a species of plant-louse infesting the Scotch pine" (Trans. Iowa state hortic. soc., 1879, v. 14, p. 96-107) [Rec., 3756]. *G: D.* (3755)

Osborn, Herbert. On a species of plant-louse infesting the Scotch pine. (Trans. Iowa state hortic. soc., 1879, v. 14. p. 96-107.)

Observations on the life-history of *chermes pinicorticis;* descriptions of different stages, and notes on habits, classification, and insect parasites of and means against this insect. *H. O.* (3756)

Osborne, J. A. Caterpillars. (Nature, 2 Nov. 1876, v. 15, p. 7, 8 cm.)

Four out of nine lepidoptera that regularly pupate succinctorily succeeded in pupating as *suspensi* when the girdle of the pupa was cut just before pupation. *G: D.* (3757)

Poisoning insects in herbarium specimens. (New remedies, July 1882, v. 11, p. 215, 9 cm.)

Describes a box specially arranged for applying the vapors of carbon disulphide [CS_2] to herbarium specimens. *G: D.* (3758)

Riley, C: Valentine. Dipterous enemies of the *phylloxera vastatrix*. (Can. entom., Feb. [9 Mch.] 1883, v. 15, p. 39.)

Crit. rev. of T: W. Fyles' "Description of a dipterous parasite of *phylloxera vastatrix*" (*op. cit.*, Dec. 1882 [29 Jan. 1883], v. 14, p. 237-239) [Rec., 3726]; the characters given of *diplosis grassator* are not sufficient to distinguish the species; the galls of *phylloxera vastatrix* [*vitifoliae*] are inhabited by another enemy, named *leucopis phylloxerae* in author's MS.; comparison of larvae and pupae of these two diptera. *B: P. M.* (3759)

[**Riley**, C: Valentine.] Galls on *eucalyptus*. (Amer. nat., May [16 Apr.] 1881, v. 15) (RILEY, C: V. Entomology . . . [May 1881]), p. 402.

Crit. rev. of R. McLachlan's "*Eucalyptus* galls" (Entom. mo. mag., Dec. 1880, v. 17, p. 145-147) [Rec., 3738]; the supposed dipterous galls probably coccidomyidous; the supposed lepidopterous galls probably not lepidopterous, but inhabited by a lepidopterous inquiline. *B: P. M.* (3760)

Riley, C: Valentine. Hackberry psyllid galls. (Can. entom., Aug. [5 Sep.] 1883, v. 15, p. 157-159, fig. 6-7.)

Crit. rev. of T: W. Fyles' "The parasite of *phylloxera vastatrix*, and the gall insect of the nettle tree" (*op. cit.*, [26] May 1883, p. 83-84) [Rec., 3728]; *phylloxera vitifoliae* has many parasites and *celtis* is attacked by many species of gall-insects; description of characters of *pachypsylla* n. g.; figures of galls of *pachypsylla* [*celtidis*] *venusta* and *p. c.-mamma*, to the latter of which species belongs the insect described in Fyles' "Notes on a gall mite of the nettle tree, *celtis occidentalis*" (*op. cit.*, Oct. [14 Dec.] 1882, v. 14, p. 198-199) [Rec., 3727]; *psylla c.-grandis* = *pachypsylla venusta;* derivation and orthography of the generic term *celtis*. *B: P. M.* (3761)

Schilde, Johannes. Frühlingsbeobachtungen über die naturimmanente erzeugung der flügelpracht und anpassung von schmetterlingen. (Entom. nachrichten, May 1884, jahrg. 10, p. 141-147.)

Separate. [Berlin, 1884.] 7 p., 23 × 14, t 16 × 9.5.

The author argues against the views held by Darwin, Weismann, and Lubbock in regard to the origin of certain types of coloration in butterflies' wings. *G: D* (3762)

Scudder, S: Hubbard. The pine moth of Nantucket, *retinia frustrana*. (MASSACHUSETTS SOCIETY FOR THE PROMOTION OF AGRICULTURE. Publications.) Boston, *A. Williams & co.*, 1883. t.-p. cover, 20 [+ 2] p., 1 col. pl., 24 × 15, t 17 × 10.

Notice. (Nation [N. Y.], 19 Apr. 1883, no. 929, v. 36, p. 341, 5 cm.)

Habits and description of *retinia frustrana*, a new species, which attacks *pinus rigida* in Nantucket, Mass.; description and colored figures of the larva, pupa and imago, and of twigs of *pinus* attacked by this insect; notes on other species of *retinia*. Appended [p. 18-23] is a notice of and extract from J: H: Comstock's "Report of the entomologist" (Rept. [U. S.] Commiss. agric. for 1879, 1880), p. 233-238. *G: D.* (3763)

Sograff, N. Zur embryologie der chilopoden. Vorläufige mittheilung. (Zool. anzeiger, 6 Nov. 1882, jahrg. 5, p. 582-585.)

Researches on the embryology of chilopoda, chiefly based on two species of *geophilus*. *G: D.* (3764)

South, Richard. On the urticating hairs of some lepidoptera. (Entomologist, Jan. 1885, v. 18, p. 3-6.)

Notes on the urtication produced by larvae, cocoons, and possibly by the imagos of certain lepidoptera, among which *liparis auriflua*, *bombyx rubi* and species of *cnethocampa* are especially mentioned; discusses causes of the urtication; quotes from T. P. Bigg-Wither's "Pioneering in Brazil," in regard to stinging caterpillars in Brazil. *G: D.* (3765)

Speziesfrage (Zur). (Entom nachrichten, 15 Nov. 1881, jahrg. 7, p. 321-323.)

Extract (from the *Correspondenzblatt der Irmitschia*, 1881, no. 10) of the report of a lecture, delivered 3 July 1881, in Erfurt, Thuringia, by Dr. Schmeideknecht, of Gumperda, on the difficulty of defining limits for species and varieties, based especially on studies of *bombus*. *G: D.* (3766)

Trimen, Roland. Protective resemblances in insects. (Entomologist, Feb. 1885, v. 18, p. 25-30.)

Part of an address on mimicry among insects including spiders, delivered at the annual meeting of the South African philosophical society. *G: D.* (3767)

Trouessart, E. L. *and* **Mégnin**, P. Sur la classification des sarcoptides plumicoles. (Comptes-rendus Acad. sci. France, 21 Jan. 1884, v. 98, p. 155-157.)

Modifications are proposed in the classification of the *analgesinae*, with some notes on the synonymy of certain genera. *G: D.* (3768)

Wallace, Alfred Russell, *see* BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE—[*46th meeting*]—*Glasgow meeting, 1876*—*Section of biology*. President's address [Rec., 2362].

Walsh, B: Dann. The grape-leaf gall-louse. *Dactylosphaera vitifoliae*, Fitch. (1st ann. rept. acting state entom. Ill., 1868, p. 21-24.) (Trans. Ill. state hortic. soc. for 1867, n. s., v. 1, 1868; Appendix, p. 21-24.)

Remarks on the natural restriction of the ravages of *phylloxera vitifoliae* to the leaves of certain species and varieties of *vitis*, and on the rule that a given species of *aphididae* or *coccidae* is generally confined to a given species of plant, and invariably to a given family; discussion of the synonymy of *dactylosphaera globosa*, the male of which is *phylloxera caryaeglobuli* and the female is *d.* [*ph.*] *caryaesemen*; *hamamelistes cornu*=*hormaphis hamamelidis*; description of habits and of gall and insects of *d.* [*ph.*] *caryaesemen* n. sp.; list of species and galls of *dactylosphaera* known to the author; references to discussions of the characters of the genera mentioned. *B: P. M.* (3769)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] The joint-worm. *Isosoma hordei*, Harris. (Amer. entom., Apr. 1869, v. 1, p. 149-158, 388 cm., fig. 113-118; p. 185, 1 cm.)

Ravages, food-plants and indications of the attacks of *isosoma hordei*; seasons, habits and parasites, phytophagic variation and generic classification of and means against this insect; figures of male and female imago; figures of male and female imagos of *semiotellus chalcidiphagus* n. sp., *eurytoma* sp. and *decatoma* sp., and of female imago of *antigaster mirabilis*; protective habits of various insects. *B: P. M.* (3770)

Webster, Francis M. Notes from Illinois; grain-feeding habits of field cricket. (Amer. nat., June [20 May] 1882, v. 16, (RILEY, C: V. Entomology....[June 1882]), p. 513-514.

Reprint, entitled, "Habits of field crickets." (Sci. amer., 17 June 1882, v. 46, p. 283, col. 2, 13 cm.

Notes on *gryllus*, *epicauta pensylvanica*, *diabrotica fossata* and *d. longicornis* as destroyers of corn [*zea mays*]. *G: D.* (3771)

Weir, J: Jenner. Danaine butterflies not subject to the attack of mites. (Entomologist, July 1882, v. 15, p. 160-161.)

Species of *danaidae* and *papilio pammon* in collections seem to be distasteful to mites; quotations of other authorities on the same subject. *G: D.* (3772)

Weir, J: Jenner. Effect of temperature on lepidoptera. (Entomologist, May 1882, v. 15, p. 115-116.)

Sudden paralyzing of *vanessa urticae* by cold. *G: D.* (3773)

Weir, J: Jenner. Note on the use of naphthaline in cabinets for the protection of insect collections. (Entomologist, July 1882, v. 15, p. 165-166.)

The author warns lepidopterists against using C: A. Blake's cones of naphthalin in their collections. *G: D* (3774)

Weir, J: Jenner. Notes on the lepidoptera-rh palocera of Hudson's bay. (Entomologist, May 1881, v. 14, p. 97-100.)

Notice and crit. rev., [by C: V. Riley], entitled "Hudson bay lepidoptera." (Amer. nat., July [22 June] 1881, v. 15, p. 572-573.) (RILEY, C: V. Entomology . . . [July 1881], p. 572-573.)

List of lepidoptera rhopalocera collected by Walton Haydon, at Moose Factory, St. James' bay, British America, in 1879 and 1880; attempt to account for the relations of this fauna to that of Europe.

B: P. M. (3775)

Weir, J: Jenner. Variations in the colour of lepidoptera. (Entomologist, Aug. 1883, v. 16, p. 169-176.)

Discusses the various forms of aberrations (heteromorphism) in colors of lepidoptera under the names albinism, xanthism, melanism, heteropoecilism, gynandrochromism, and hermaphrodism; and the forms of constant variation (orthopoecilism) under the names polymorphism, topomorphism, atavism, dimorphism, trimorphism and horeomorphism; gives examples of each of these forms of variation. *G: D.* (3776)

Westhoff, Friedrich. Der maikäfer auf der wanderschaft. (11ter jahresber. d. westfäl. prov.-vereins f. wissensch. u. kunst, pro 1882, 1883, p. 9-12.)

Record of observation of a great swarm of *melolontha vulgaris* seen migrating from the west toward the east. *G: D.* (3777)

Weyenbergh, H. Sobre la familia *pulicidae* con descripcion de algunas nuevas especies. (Periódico zoológico argentino, 1881, v. 3, p. 261-268, 9-17.)

Separate. Córdoba, 1881. t. p. cover+p. 261-268, 9-17, 23×17, t 16.5×10.

List of 53 species of *pulicidae* and their hosts; describes, as new species, *ceratophyllus rufulus* (from *cervus rufus*), *c. isidori* (from *vespertilio isidori*), *pulex* (*hectopsylla?*) *testudo* (from *strix perlata*), *p. nasuae* (from *nasua socialis*), *p. obscurus* (from *canis azarae* and *c. gracilis*), *p. concoloris* (from *felis concolor*) *and p. cavicola* (from *cavia leucopyga*).

G: D. (3778)

Williston, S: Wendell. An anomalous bombylid. (Can. entom., Nov. 1879, v. 11, p. 215-216.)

Description of a new species [unnamed] of *anthrax*, with remarks on anomalous neuration in the wings of one specimen of this species.

B: P. M. (3779)

Williston, S: Wendell. On the classification of North American diptera. 1st paper. (Bull. Brooklyn entom. soc., Feb. 1885, v. 7, p. 129-139, 3 fig.)

Separate. [Brooklyn, N. Y., 1885.] t.-p. cover + p. 129-139, 22 × 15, t 16.5 × 10.

General characters of the *syrphidae;* table of the genera of North American *syrphidae;* discusses the characters and their value in the genera *euceratomyia*, *merapioidus*, and *pelococera*. *G: D.* (3780)

Williston, S: Wendell. Dipterous larvae from the western alkaline lakes and their use as human food. (Trans. Conn. acad. arts and sciences, July 1883 [Sept. 1884], v. 6, p. 87-90, 1 fig.)

Separate. [New Haven, Ct., Aug. 1883.] p. 1-4, 23 × 15, t 17.5 × 10.5.

Account of the dipterous larvae, living in alkaline lakes of Nevada and California, which are used as food by Pae-Ute indians; figure of the larva and description of the imago under the name of *ephydra californica*, under which name A. S. Packard, *jr.* has already described larvae presumably of the same species; an account of the mode of preparing the larvae for food is quoted from a letter by W: H. Brewer. *G: D.* (3781)

Williston, S: Wendell. On the North American asilidae (*dasypogoninae*, *laphrinae*), with a new genus of *syrphidae*. (Trans. Amer. entom. soc., Dec. 1883, v. 11. p. 1-35, pl. 1.)

Table of genera of North America *dasypogoninae* and *laphrinae;* describes one new genus, *leptomyia*, of the *dasypogoninae*, and one, *nausigaster*, of the *syrphidae;* describes 22 new species of *asilidae* and one of *syrphidae*. *G: D.* (3782)

Williston, S: Wendell. On the North American *asilidae*. Part 2. (Trans. Amer. entom. soc., Jan. 1885, v. 12, p. 53-76.)

Continuation of author's "On the North American *asilidae* (*dasypogoninae*, *laphrinae*), with a new genus of *syrphidae*" (*op. cit.*, Dec. 1883, v. 11, p. 1-35) [Rec., 3782]. Tables of genera of *asilinae*, and of species of *laphria*, *mallophora*, *promachus*, *erax*, and *proctacanthus;* describes 16 new species and gives numerous synonymical notes. *G: D.* (3783)

Williston, S: Wendell. North American *conopidae: stylogaster*, *dalmannia*, *oncomyia*. (Trans. Conn. acad. arts and sciences, July 1883 [Sept. 1884], v. 6, p. 91-98.)

Separate. [New Haven, Ct., Aug. 1883.] p. 5-12, 23 × 15, t 17.5 × 10.5.

Describes the following new species: *stylogaster neglecta*, *dalmannia picta*, *oncomyia modesta*, and *o. baroni;* redescribes several species belonging to the same genera. *G: D.* (3784)

Wilson, Owen S. Remarks on rearing lepidopterous larvae in confinement. (Entomologist, Feb. 1883, v. 16. p. 47-48.)

Description of a mode of rearing larvae of lepidoptera in anchovy jars. *G: D.* (3785)

Worthington, C: Ellis. A model collecting box. (Our home and science gossip, Sept. 1881, v. 5, p. 103, col. 2-4, 38 cm.)

Description of an excellent field-collecting box, capable of preserving small lepidoptera for a long time limber, and containing several conveniences.

B: P. M. (3786)

Wright, W. T. Hermaphrodite *odonestis potatoria*. (Entomologist, Aug. 1883, v. 16, p. 188.)

Description of a specimen of *odonestis potatoria* in which the right antenna is that of a male and the rest of the insectis female. *G: D.* (3787)

ENTOMOLOGICAL ITEMS.

DR. A. GESTRO, whose address is at the Museo Civico, Genoa, Italy, would like a correspondent with whom he could exchange coleoptera of Italy, New Guinea, and the Malay archipelago, for those of North America.

HERR LEHRER FRANZ BUŽEK, in Rakowitz, Hungarian, Austria, desires to exchange coleoptera and lepidoptera of his own locality for those of North America. Address as above given.

ASSISTANT WANTED.—Dr. C. V. Riley is looking for some one experienced in collecting and mounting insects, to assist in the work of the Division of Entomology at the Department of Agriculture in Washington. Salary according to ability. Applicants may address him at the Department.

SOUTH AMERICAN INSECTS FOR SALE.—M. Louisa Ross, Hyde Park, N. Y., offers for sale a 15-drawer cabinet containing ten drawers of butterflies, one of moths, one of more than 200 beetles, and one variety drawer, all South American; one of moths and one of butterflies, both North American; systematically arranged. Price, $500, which is stated to be very much below cost. The beetles will be sold for $60, if bought separately or with the most rare of the butterflies. The other specimens may be sold by the drawer. The collection is at the Cooper Institute, New York City, where it can be seen.

STAPHYLINIDAE OF BUENOS AIRES.—Mr. Félix Lynch Arribálzaga has just completed a paper, entitled "Estafilinos de Buenos Aires," which occupies the first 392 pages of vol. 7 of the Boletin de la Academia nacional de ciencias en Córdoba, and which is an important contribution to the coleopterous fauna of the Argentine Republic. The author gives descriptions and notes upon 118 species (belonging to 58 genera) which are found in the province of Buenos Aires. A few of the species are North American.

ENTOMOLOGICAL CLUB OF A. A. A. S.—The next meeting of the American association for the advancement of science will be held at Ann Arbor, Mich., commencing Aug. 26th 1885. The Entomological club will meet at that place on August 25th 1885, according to its by-laws; exact locality not yet determined.

Will those members of the club or other entomologists who expect to be present please notify one of the undersigned, and also send in the title of any papers they expect to read, and state the length of time they expect to occupy, so that a program can be arranged? The exact place and hour of meeting, as well as the program so far as fixed, will be published later.

John B. Smith, Brooklyn, N. Y., *Chairman.*
Herbert Osborn, Ames, Iowa.
B. Pickman Mann, Washington, D. C.
Committee.

DATA ON ANNUAL ADDRESSES. The earlier annual addresses of the retiring presidents of the Cambridge entomological club, of which we publish in this numero that for 1885, were as follows:—

1st annual address, by S: H. Scudder, Jan. 1878. [*See* PSYCHE, Jan.-Feb. (14 June) 1878, v. 2, p. 97-116 (Rec., 1401).]

2nd, by E: P. Austin, 10 Jan. 1879. [*See* PSYCHE, 1879, v. 2: (14) Mar., p. 217-223; (11) Apr., p. 227-228 (Rec., 1434).]

3rd, by E: Burgess, 9 Jan. 1880. [*See* PSYCHE, Mar. (1 May) 1880, v. 3, p. 27-43 (Rec., 2943).]

4th, by E: Burgess, 14 Jan. 1881. [Not published; *see* PSYCHE, Jul.-Sep. 1881 (7 Mar. 1882), v. 3, p. 245 (Rec., 2950).]

5th, by E: L. Mark, 13 Jan. 1882. [Not published.]

6th, by S: H. Scudder, 12 Jan. 1883. [Not published; *see* PSYCHE, Jan.-Feb. (5 May) 1883, v. 4, p. 13.]

7th, by B: P. Mann, 11 Jan. 1884. [*See* PSYCHE, Apr. (14 June) 1884, v. 4, p. 155-159.]

PRESERVATION OF INSECTS.—To remove the verdigris which forms upon the pins the pinned insects should be immersed in benzine and left there for a time; several hours is generally long enough. The administration of this bath cannot be too highly recommended for beetles which have been rendered unrecognizable by grease, especially when dust has been mixed with the grease. This immersion, of variable duration according to circumstances, will restore to these insects, however bad they have become, all their brilliancy and all their first freshness, and the efflorescences of cupric oxide will not reappear. This preventative and curative method is also readily applicable to beetles glued upon paper which have become greasy: plunge them into benzine in the same way, and as gum is insoluble in the liquid, they remain fastened to their supports. Pruinose beetles, which are few in number, are the only ones that the benzine bath can alter; the others which are glabrous, pubescent, or scaly, can only gain by the process, and they will always make a good show in the collection ...—A. Dubois in *Feuille des jeunes naturalistes*, March 1885, p. 71.

NECROLOGY. Since our last issue announcements of the deaths of the following entomologists have come to our notice: Constant Bar, entomologist at Cayenne, French Guiana, died there in 1884. Professor Lauritz Esmark, director of the zoological museum of the university of Christiania, died there in Dec. 1884. George Mawson, an English lepidopterist, died 10 Nov. 1884. L. Rudolf Meyer-Dür, who has published articles upon entomology since 1841, died 2 March 1885, at Zürich, Switzerland, aged 73. Louis Auguste Remacle Mors, a Parisian entomologist and civil engineer, died at Paris, 7 Dec. 1884, at the age of 58 years. Major Frederic J. Sidney Parry, a London coleopterist, died 1 Feb. 1885, at The Warren, Bushey Heath, aged 74. Titian Ramsay Peale, lepidopterist, born Oct. 1799, died 13 March 1885, in Philadelphia, Pa. Edward Caldwell Rye, a well-known English coleopterist, and editor of the Zoological record, born in London 10 April 1832, died of the small-pox, in the same city, 7 Feb. 1885. Sidney Smith, entomologist and conchologist, died at Walmer, England, 28 Dec. 1884, aged nearly 80 years. Friedrich Stein, professor in the university of Prague, who was born in 1818 in Niemegk, Prussia, died 9 Jan. 1885 in Prague; Dr. Stein was a well-known writer upon infusoria, and in earlier life the author of a number of entomological papers, among which the most prominent was one upon the sexual organs and the structure of the abdomen of female beetles, with nine large plates, published in 1847. The January (1885) numero of *Rovartani lapok* gives a biographical notice, list of publications, and portrait of Dr. O. Tömösváry, whose death we have already noted; he was born 12 Oct. 1852, at Magyaró, Hungary, and died 14 August 1884, at Déva, Hungary. *G: D.*

UPON A PECULIAR ORIENTAL LOCALITY FOR HONEY.*— Xenophon, in his description of the "Retreat of the ten thousand," says that his soldiers drank barley wine, oinon kritys, as it had been introduced into Egypt by Osyris 4000 years previously, according to the Egyptian tradition, to take the place of other spirituous liquors. Sophocles and other writers mention this barley wine also. Xenophon says likewise that his soldiers were in the habit of getting drunk by the use of a certain kind of honey, and were poisoned by it. It seems that the bees suck the nectar from the flowers of poisonous plants which are found in that region. Such an intoxicating, soporific honey is still found there under the name of *Meli menomenon*. I have succeeded by many tedious investigations in establishing the following. I obtained the information principally through a former pupil of mine who is now settled in Kerchasund in Persia as a physician and apothecary.

* Translated from Prof. Dr. Xaver Landerer's "Mittheilungen aus dem orient" (Deutsch-amer. apothekerzeitung, 15 Dec. 1882, jahrg. 3, p. 582).

I have already reported to you upon the oriental mania for opium. But the opium which is produced for the western countries and for China is very little in comparison with the domestic consumption. In the districts around Erzeroum, around Kerchasund and farther into the Persian districts are to be found colossal plantations, whose product is almost exclusively used where produced.

In all probability it is the nectar of these poppy plants which gives the honey in those regions its toxic qualities.

This honey is used as a soporific for children and is employed also against various affections, especially such as arise from improper food—sour milk, badly cooked rice, goat's milk, etc.—as for instance colic, and often is of aid where symptoms of death have already appeared.

The opium which is collected from the poppy plants in those regions contains usually 12 per cent. and rarely less than 10 per cent. of morphium. I had an opportunity to see such opium in the possession of a Persian merchant. It consisted of round balls of a few drachms weight which were wrapped in goldleaf. This is the kind which is used principally for smoking and chewing.

PUPAL RETREAT OF CHARAGIA VIRESCENS.—Mr. G: Vernon Hudson, in an article in the *Entomologist* for February 1885, entitled "Life-history of *Charagia virescens*," gives some interesting observations in regard to the habits of this bombycid from New Zealand. The larva bores in the wood of living trees, often in that of *Aristotelia racemosa* (New Zealand currant), *Olea apetala* (black maize) and *Leptospermum* (manuka). When ready to pupate the larva constructs a complicate tunnel, described as follows. "It consists of a spacious, irregular, but shallow, cavity just under the bark, having a large opening to the air, which is entirely closed with a thin silken covering almost exactly the same shape and size as the numerous scars which occur at intervals up the trunks of nearly all the trees. Three large tunnels open into this shallow cavity; one in the centre, which runs into the middle of the stem; and one on each side, which run right and left just under the bark. These are usually very short, but sometimes extend half-way round the tree, and occasionally even join one another on the opposite side. The central tunnel has a slightly upward direction for a short distance inwards, which effectually prevents it from becoming flooded with water; afterwards it pursues an almost horizontal course until it reaches the centre of the tree, when it appears to suddenly terminate. This, however, is not the case, for, if the gallery floor is carefully examined a short distance before its apparent termination, a round trap-door will be found compactly constructed of very hard, smooth silk, corresponding with the surrounding portion of the tunnel so exactly that it almost escapes detection. When this lid is removed a long perpendicular shaft is disclosed, which runs down the middle of the tree to a depth of fourteen or sixteen inches [35-40 cm.], and is about six lines [13 mm.] in diameter; at the bottom of this the elongate *virescens* pupa sleeps quietly and securely in an upright position, the old larval skin forming a soft support for the terminal segment of the pupa to rest on. The upper end of this vertical shaft is lined with silk, which forms a framework on which the trap-door rests when it is closed: the lid itself, being of a larger size than the orifice, which it covers, causes it to be extremely difficult, if not impossible, to open it from the exterior, especially when it fits down very closely, which is nearly always the case as long as the insect remains in its burrow. The object of this most ingenious contrivance is in all probability, to prevent the ingress of insects; blattae, slugs, spiders, and immature 'wetas' (*Hemideina*) are frequently found in both central and lateral tunnels, but they are quite unable to pass the trap-door, and are most likely entirely ignorant of the existence of the vertical burrow."

METAMORPHOSES OF ARCTIC INSECTS. In the chapter entitled, "Das insektenleben in arktischen ländern," which Dr. Christopher Aurivillius contributes to the account of A. E. Nordenskiöld's arctic investigations, published this year in Leipzig,* the author says: "The question of the mode of life of insects and of its relation to their environment in the extreme north is one of especial interest. Knowing, as we do, that any insect in the extreme north has at the most not more than from four to six weeks in each year for its development, we wonder how certain species can pass through their whole metamorphosis in so short a period. R. McLachlan adverts, in his work upon the insects of Grinnell Land, to the difficulties which the shortness of the summer appears to put in the way of the development of the insects, and expresses the belief that the metamorphosis which we are accustomed here to see passed through in one summer there requires several summers. The correctness of this supposition has been completely shown by the interesting observations which G. Sandberg has made upon species of lepidoptera in South Varanger, at 69° 40′ north latitude. Sandberg succeeded in following the development from the egg onward of some species of the extreme north. *Oeneis bore*, Schn., a purely arctic butterfly, may be taken as an example. This species never has been found outside of arctic regions and even there occurs only in places of purely arctic stamp. It flies from the middle of June onward, and lays its eggs on different species of grass. The eggs hatch the same summer; the larva hibernates under ground, continues eating and growing the next summer, and does not even then reach its full development, but winters a second time and pupates the following spring. The pupa, which in closely-related forms, in regions further to the south, is suspended free in the air upon a blade of grass or like object, is in this case made in the ground, which must be a very advantageous habit in so raw a climate. The imago leaves the pupa after from five to six weeks, an uncommonly long period for a butterfly. In more southern regions the butterfly pupa rests not more than fourteen days in summer. The entire development, then, takes place much more slowly than it does in regions further south. Sandberg has shown, then, by this and other observations, that the arctic summer, even at 70° N., is not sufficient for the development of many butterflies, but that they make use of two or more summers for it. If then more than one summer is requisite for the metamorphosis of the butterflies, it appears to me still more likely that the humble-bees need more than one summer for their metamorphosis. With us only the developed female lives over from one year to the next; in spring she builds the new nest, lays eggs, and rears the larvae which develop into workers who immediately begin to help in the support of the family; finally, toward autumn, males and females are developed. It seems scarcely credible that all this can take place each summer in the same way in Grinnell Land, at 82° N., especially as the access to food must be more limited than it is with us. The development of the humble-bee colony must surely be quite different there. If it was not surely proved that humble-bees occur at so high latitudes, one would not, with a knowledge of their mode of life, be inclined to believe that they could live under such conditions. They seem, however, to have one advantage over their relatives in the south. In the arctic regions none of those parasites are found which in other regions lessen their numbers, such as the *conopidae* among the flies, the mutillas among the hymenoptera, and others."

* NORDENSKIÖLD, A. E. Studien und forschungen veranlasst durch meine reisen im hohen norden. Autorisirte ausgabe. Leipzig, *Brockhaus*, 1885. 9 + 521 p., 8 pl., maps, O. il.

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APRIL-JUNE 1885.

CONTENTS:

ADVERTISEMENTS 270
THE INSECTS OF BETULA IN NORTH AMERICA—*Anna Katherina Dimmock* . 271-286
NEW SOLVENT OF CHITIN 286
HERBERT KNOWLES MORRISON 287
PROCEEDINGS OF SOCIETIES—Linnean Society of New South Wales . . . 287-288
OBSERVATIONS ON DECAPITATED SILKWORM MOTHS 288
BIBLIOGRAPHICAL RECORD, no. 3788-3884 289-296
ENTOMOLOGICAL ITEMS 297-300

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PSYCHE.

THE INSECTS OF *BETULA* IN NORTH AMERICA.

BY ANNA KATHERINA DIMMOCK, CAMBRIDGE, MASS.

(*Concluded from p 243.*)

Amphidasys cognataria Guenée (Hist. nat. d. ins., 1857, v. 9, Uran. et phal., v. 1, p. 208). Cramer (Bull. Brooklyn entom. soc., Aug. 1883, v. 6, p. 48) briefly describes the eggs of this species, of which about five hundred were deposited 3 June. Bowles (Can. entom., April 1871, v. 3, p. 11-12) (Ann. rept. Entom. soc. Ontario, 1871, p. 38-39) describes a variety of the larva which fed on "black currant" [*Ribes ?nigrum*], and Goodell (*op. cit.*, April 1878, v. 10, p. 67) describes another variety which fed on apple and pear. Lintner (Entom. contrib., no. 3, 1874, p. 166) briefly describes the larva, giving *Acer* as food-plant, and Packard (Guide study ins., 1869, p. 322) gives a few notes on the larva, which he states feeds upon *Ribes aureum*, *R. ?grossularia*, and *Spiraea ?tomentosa*. Pilate (Papilio, May 1882, v. 2, p. 71) gives "honey-locust" (*Gleditschia triacanthos*) as food-plant. Lintner (Entom. contrib. [no. 1], 1869, p. 64) gives plum as food-plant. To the above food-plants may be added *Betula alba*, *B. lenta*, *Castanea vesca*, *Salix*, and *Spiraea sorbifolia*. The larva varies from pea-green to brownish grey or even brownish black in general color; as far as noticed the green form is from *Ribes*, *Salix* and *Spiraea*, while those from apple exhibit all the color variations; on *Betula* and *Castanea* the larvae are grey. Similar variations have been noticed in the larvae of *Amphidasys betularia*, a European species. The larvae often rest in a partially twisted position, with their rigid bodies at a considerable angle from the stem to which they cling, thus imitating very closely twigs and petioles. The larvae are common in New England in July and August; they pupate from the latter part of July to September, the pupa hibernating under leaves and rubbish.

Cymatophora crepuscularia Treits (Schmett. v. Europa, 1827, v. 6, pt. 1, p. 190). Goodell (Can. entom., Apr. 1878, v. 10, p. 67) has described the larva of this species from a single specimen taken on plum, 30 May; pupation took place 6 June, and the imago emerged 19 June. In Europe this very variable larva has often been reared. Herr (Anleitung d. schmett. u. raupen ... 1833, pt. 2, p. 272) gives a good description of the larva, and states that its food-plants are *Aquilegia*, *Salix*, *Populus*, *Alnus*, *Ulmus*, *Spartium*, and *Sambucus*. Kaltenbach (Pflanzenfeinde, 1872, p. 614-615) writes "A very common geometrid whose larva is very differently marked according to its food-plant. On *Salix* Borkhausen found it brownish-green, on Italian poplar grey-green, on *Alnus* brownish-grey, on *Ulmus* lighter green than on *Salix*, on *Sambucus* grey-brown, etc. Treitschke's specimens reared on plum were yellowish. Pupation takes place under the ground; the moth appears in two generations, in spring from hybernated pupae and again in July. The larvae appear in June and in September." Kaltenbach (*op. cit.*, p. 110, 234, 302, and 435) adds the following to previously mentioned food-plants: *Betula alba*, *Genista*, *Quercus*, *Rubus*, *Lonicera*, and *Ligustrum*. The larva of this species is common on *Betula alba* in eastern Massachusetts, where it is found ready for pupation as early as the middle of June. Of three larvae taken 12 Aug. 1882, one pupated 29 Aug. and hibernated as pupa, developing an

imago the next spring; another pupated 2 Sept. and died later, and the third pupated 2 Sept. and the imago appeared 28 Sept. of the same year. Two annual broods of larvae are therefore probable in New England, as in Germany, but part of the second brood apparently emerge and oviposit in late autumn, while the rest hibernate as pupae.

Paraphia subatomaria Guenée (Hist. nat. d. ins., 1857, v. 9, Uran. et Phal., v. 1, p. 272). A larva taken on *Betula alba*, at Belmont, Mass., 12 Aug. 1882, pupated 19 Sept. and a male imago emerged 8 Oct. 1882. This larva was mistaken for a young larva of *Cymatophorà crepuscularia*. Another larva, taken on the same species of plant, at Cambridge, Mass., 10 Sept. 1882, pupated 27 Sept. and produced a female imago 28 Oct. 1882. A third larva taken in Cambridge, on the same plant in the fall of 1883, pupated, and would have hibernated as pupa had it not been kept in a warm room; the moth emerged during the winter. Packard (Mon. geom. moths U. S., 1876, p. 418) writes "The moth has been raised by Mr. W. Saunders, of London, Canada, from a 'brown geometric larva on the pine, the imago appearing June 24th'."

Ephyra pendulinaria Guenée (Hist. nat. d. ins., 1857, v. 9, Uran. et phal., v. 1, p. 414). Packard (Mon. geom. moths U. S., 1876, p. 363-364) gives a description, by S. H. Scudder, of the larva and pupa of this species; the larva fed on *Comptonia asplenifolia*. A larva of this species, taken on *Betula alba*, at Wachusett, Mass., 26 Aug. 1882, pupated 28 Aug., and the imago appeared 14 May 1883.

Anagoga pulveraria Linn. (Syst. nat., 1758, *ed. 10*, p. 521). Herr (Anleitung d. raupen d. deutsch. schmett., 1833, p. 284) describes larva and pupa, and gives *Salix caprea* as food-plant of this species. Kaltenbach (Pflanzenfeinde, 1872, p. 571 and 598) gives *Salix* and *Betula* as food-plants. Packard (Mon. geom. moths, 1876, p. 488-489) quotes Merryfield's description of the larva, and states, on authority of Goodell, that the larva is found on *Corylus*.

Endropia armataria Herrich-Schaeffer (Samml. neuer od. wenig bekannter aussereur. schmett., 1850-1858, pl. 65, fig. 373-374). Saunders (Can. entom., Oct. 1871, v. 3, p. 130-131) (Ann. rept. Entom. soc. Ontario, 1871, p. 38) describes the larva of this species which he found on species of *Ribes*. A female of this species taken 15 June 1883, in Cambridge, Mass., was confined over fresh twigs of *Acer*, *Ribes rubrum* and *R. aureum*. On 18 June she laid two rows of elongated, flattened eggs upon a leaf of *Acer;* their color was light green, but by 20 June they had become shining carmin-red, which later became dull-red. The eggs were 0.7 mm. long, 0.5 mm. wide and 0.4 mm. high, and were placed closely side by side in rows, and gummed to the leaf. They hatched 27 June. The larvae would not readily eat leaves of *Ribes*, but ate, in order of preference, leaves of *Betula alba*, of *Acer*, and of apple. One pupated 2 Aug. 1883 and the imago appeared 19 Aug. 1883; the second pupation occurred 6 Aug. 1883, but the imago did not appear until 3 June 1884; two more pupated 17 Aug. 1883, both of which produced imagos about 7 June 1884. In this case, of the four larvae which succeeded in producing imagos, all were subjected as nearly as possible to equal conditions, being reared in the same jar, upon the same plants, which were kept fresh with their stems in water, yet one of the imagos appeared the same fall, only seventeen days after pupation, while the three others remained about ten months in the pupal state. Those reared by Mr. Saunders hibernated as pupae.

Eugonia alniaria Linn. (Syst. nat., 1758, *ed. 10*. p. 519) [= *E. magnaria* Guenée]. The eggs of this species are flattened, oblong, 1.1 mm. long, 0.6 mm. wide, and 0.5 mm. high. They are of a greenish-brown, somewhat polished bronze color, and when laid upon a smooth surface are arranged side by side in a curve having the length of the abdomen of the female moth for its radius. When laid upon bark and rough surfaces the eggs are in

broken, short rows. A single female deposits five hundred to six hundred eggs. Oviposition takes place in September and October, and the eggs hatch in May and June, hibernation taking place in the egg state, as is the case with some other species of *geometridae*. Hellins (Entom. mo. mag., Mar. 1870, v. 6, p. 222) gives similar dates for oviposition and hatching in England. The larva and pupa are described by Herr (Anleitung d. raupen. d. deutschen schmett., 1833, p. 258) who enumerates the following food-plants: *Betula*, *Alnus*, *Corylus avellana*, *Carpinus betulus*, *Ulmus*, apple, pear, stone-fruit, and *Tilia*. Herold (Teutscher raupenkalender, 1845, p. 135) gives *Fagus* in addition to the above-mentioned trees. Harris (Entom. corresp., 1869, p. 320) gives notes on different stages of this species. Kaltenbach (Pflanzenfeinde, 1872, p. 89, 218, and 552) adds *Acer*, *Rosa* and *Populus* as food-plants. Lintner (Entom. contrib., no. 3, 1874, p. 165), in a note on *Eugonia magnaria*, gives *Syringa vulgaris* as food-plant. Packard (Mon. geom. moths, 1876, p. 530) quotes descriptions of larva and pupa by Goodell and by Scudder; the former entomologist gives *Castanea vesca*, and the latter *Betula lenta* as food-plant. Roüast (Annales Soc. linn. de Lyon, ann. 1882, [1883], v. 29, p. 340) adds *Quercus robur* to the food-plants. Packard (Bull. no. 7, U. S. entom. comm., 1881, p. 92) repeats Goodell's description of the larva and pupa, adds one of the moth, and further remarks that Scudder's description "is so different from Mr. Goodell's that I fear it refers to a different insect." This is not, however, the case, but the larva is very variable in coloration. Worthington (Can. entom., Jan. 1878, v. 10, p. 16) writes, "This larva evidently changes its color somewhat with different food, as these [larvae] closely resemble the bark of this tree [maple]." The general coloration may vary to match that of the bark of the tree on which the larvae feed, but the head, which is the part of the larva that varies most, is slate-grey, green, or dull red in specimens taken from maple. These larvae, having molted at least four (probably five) times, pupate from the latter part of July to the end of September; the pupal state lasts from eighteen to twenty days, the imagos flying from the middle of September until the last of October in New England. The larvae are not rare upon *Betula alba* and *B. lutea*.

Catocala relicta Walk. (List lep. ins. Brit. mus., 1857, pt. 13, p. 1192-1193.) Bunker (Can. entom., May 1883, v. 15, p. 100) states that *Populus* is the favorite food-plant of the larva of this species. Hulst (Bull. Brooklyn entom. soc., July 1884, v. 7, p. 48) says "Food-plant, white birch and silver poplar; and probably all species of *Betula* and *Populus*." The same author (*l. c.*, June 1884, v. 7, p. 15-16) gives structural characters and habits of the larvae of *Catocala*. The European *C. fraxini*, regarded by some authors to be a synonym of *C. relicta*, feeds, as larva, on *Populus*, *Betula*, *Acer*, *Ulmus*, *Quercus*, and *Fraxinus*. *C. relicta* has been reared by G: Dimmock, in Springfield, Mass., from a full-grown larva taken under circumstances which made it almost certain that its food-plant was *Acer*.

Brephos infans Möschler (Wien. entom. monatsschr., Mar. 1862, v. 6, p. 134-136, pl. 1, fig. 6). Harris (Entom. corresp., 1869, pl. 1, fig. 4) figures the imago of this species. Lintner (Entom. contrib., no. 4, 1878, p. 227-229) gives notes upon the habits of the imago which render it almost certain that the larva feeds upon *Betula*. The larvae of the European species of this genus feed upon *Betula alba*, the larva of *Brephos parthenias* living between leaves that it spins together upon high twigs. The imagos of *B. infans* are not rare about *Betula alba*, extremely early in the spring, both in eastern and western Massachusetts.

Orthosia instabilis Fabr. (Entom. syst., 1793, v. 3, p. 119) [= *Taeniocampa incerta* Hübn.]. Kaltenbach (Pflanzenfeinde, 1872, p. 429-430, 550, 640) gives the following food-plants for the larva of this species in Europe:

Apple, *Ulmus*, *Tilia*, *Salix*, *Quercus*, *Fraxinus*, *Betula alba*, *Populus* and *Carpinus;* to this list Roüast (Annales Soc. linn. Lyon, ann. 1882, [1883], n. s., v. 29, p. 315-316) adds *Amygdalus communis*, *Crataegus oxyacantha*, and *Centaurea jacea*.

Apatela xyliniformis Guen. (Hist. nat. d. ins., 1852, v. 5, Noct., v. 1, p. 56). Thaxter (Papilio, Jan. 1883, v. 3, p. 17) states that the larva of this species feeds on *Betula* and blackberry [*Rubus*].

Apatela brumosa Guen. (Hist. nat. d. ins., 1852, v. 5, Noct., v. 1, p. 52). Thaxter (Papilio, Jan. 1883, v. 3, p. 17) states that the larva of this species feeds on *Betula*, *Salix*, and *Populus*.

Apatela dactylina Grote (Proc. Bost. soc. nat. hist., April 1874, v. 16, p. 239). Thaxter (Psyche, May-June [9 July] 1877, v. 2, p. 35) gives *Betula* and *Salix* as food-plants of the larva of this species.

Apatela americana Harr. (Rept. ins. injur. veg., 1841, p. 317). Harris (*op. cit.*, p. 317-318) describes the larva and cocoon of this species: he writes, "The caterpillar eats the leaves of the various kinds of maple and sometimes also those of the elm and chestnut." The same author (Treatise on ins. injur. veg., 1862, p. 436-437) figures larva, pupa, and imago of this species and adds *Tilia* to the food-plants; and (Entom. corresp., 1869, p. 311) again describes the larva. In Amer. entom., April 1869, v. 1, p. 166, this species is stated to feed on *Populus dilatata* and *P. monilifera*, and Riley (2nd rept. state entom. Mo., 1870, p. 121) gives *Betula* and *Alnus* as food-plants. Coquillett (Papilio, Jan. 1881, v. 1, p. 6) describes the larva, and gives red oak (*Quercus*) as food-plant. Thaxter (Papilio, Jan. 1883, v. 3, p. 17) adds *Juglans*, *Fraxinus* and *Platanus* to the recorded food-plants.

Apatela vulpina Grote (Can. entom., Jan. 1883, v. 15, p. 8-9). Thaxter (Papilio, Jan. 1883, v. 3, p. 14-15) describes the larva of this species, and gives *Populus* and *Betula* as food-plants.

Apatela spinigera Guen. (Hist. nat. d. ins., 1852, v. 5, Noct., v. 1, p. 45). Thaxter (Psyche, March-April [24 Sept.] 1878, v. 2, p. 121-122) describes the larva of this species and gives as food-plants *Rubus* and *Betula*.

Apatela occidentalis Grote and Rob. (Proc. Entom. soc. Phil., May 1866, v. 6, p. 16). The larva of this species is described by Harris (Entom. corresp., 1869, p. 311-312), who found it feeding on plum, cherry, and *Pyrus americana*. Lintner (Entom. contrib. [no. 1], 1869, p. 62) adds apple to the food-plants. Saunders (Can. entom., March 1872, v. 4, p. 50) describes the larva. Packard (Papilio, Nov.-Dec. 1882, v. 2, p. 181) briefly describes the larva and pupa. Thaxter (Psyche, May-June [9 July] 1877, v. 2, p. 35) gives *Ulmus* as food-plant. A specimen taken on *Betula lutea*, at Wachusett, Mass., 26 Aug. 1882, pupated 30 Aug., and the imago appeared 12 June 1883. This larva, which also ate *Betula alba*, did not entirely agree in coloration with Saunders' description.

Charadra propinquilinea Grote (Trans. Amer. entom. soc., Jan. 1873, v. 4, p. 293-294). Goodell (Papilio, Feb. 1881, v. 1, p. 15) describes the larva of this species and gives "white birch" as food-plant. Thaxter (Papilio, Jan. 1883, v. 3, p. 11-12) gives notes on the larva, which feeds on *Betula*, *Juglans*, *Acer* and *Quercus*.

Charadra deridens Guen. (Hist. nat. d. ins., 1852, v. 5, Noct., v. 1, p. 35-36). Saunders (Can. entom., Sept.-Oct. 1870, v. 2, p. 145-146) describes the larva, and Lintner (Entom. contrib., no. 3, 1874, p. 157) figures and describes it. Thaxter (Papilio, Jan. 1883, v. 3, p. 11-12) describes the egg, the seven larval stages, and the cocoon; the larva feeds upon red oak (*Quercus*), *Betula* and *Ulmus*.

Cossus sp. Lintner (Entom. contrib., no. 4, 1878, p. 244-245) states that the larvae of a *Cossus*, the pupal cases of which prove to be those of some as yet undescribed species, bore in the wood of *Betula populifolia*.

Gastropacha americana Harris (Rept. ins. injur. veg., 1841, p. 273-274). This author

(*l. c.*, and Treatise on ins. injur. veg., 1862, p. 377-378) briefly describes the larva, which he states feeds upon apple, and, on authority of Abbot, upon *Quercus* and *Fraxinus*. Lintner (Entom. contrib. [no. 1], 1869, p. 193), in a note upon the larva, gives *Betula* as food-plant, and later (Entom. contrib., no. 3, 1874, p. 154-155) describes the larva, which he states to feed on *Betula lenta* and *Acer*. Lyman (Can. entom., Aug. 1874, v. 6, p. 158) describes the eggs of this species.

Clisiocampa silvatica Harris (Rept. ins. injur. veg., 1841, p. 271-272) [= *C. disstria* Hübn.]. Harris (*op. cit.*, p. 272) describes the larva of this species, giving as food-plants, *Quercus*, *Juglans* and apple; later (Treatise on ins. injur. veg., 1862, p. 375-376, pl. 7, fig. 18-19) he repeats the description, and adds a colored figure of the larva and imago, adding wild cherry to the food-plants; again he describes (Entom. corresp., 1869, p. 292) the larva. Morris (Synop. lepid. N. A., 1862, p. 326) quotes Harris's descriptions (1841) of the larva and imago. Riley (Amer. entom., July-Aug. 1870, v. 2, p. 261-265, and 3rd rept. state entom. Mo., 1871, p. 121-127) describes eggs and egg-mass, larva and imago, giving, in addition to the food-plants mentioned above, *Fraxinus*, *Tilia*, *Rosa*, *Carya*, plum, and peach. Saunders (Can. entom., July 1872, v. 4, p. 134) repeats Riley's figures, and (*op. cit.*, Aug. 1877, v. 9, p. 159) gives another figure of the larva, adding *Acer*, *Crataegus* and *Fagus* to the food-plants; later Saunders (*op. cit.*, Feb. 1878, v. 10. p, 21-23) gives notes on the eggs of this species and of *C. americana*, and on the destruction of these eggs by mites. Packard (Bull. 7, U. S. entom. comm., 1881, p. 40-41) figures egg, larva, and imago, and describes the larva and the male and female imagos. The larva of this species eats leaves of *Betula alba*.

Anisota senatoria Abb. & Smith (Nat. hist. lepid. ins. Ga., 1797, v. 2, p. 113, pl. 57). Harris (Rept. ins. injur. veg., 1841, p. 291-292) describes the larva, pupa, and imago of this species; the larva, he states, feeds upon white and red oaks [*Quercus* sp.]. Morris (Synop. lepid. N. A., 1862, p. 231) describes the larva and imago. Harris (Treatise on ins. injur. veg., 1862, p. 405-406) figures and describes larva, pupa, and imago, and (Entom. corresp., 1869, p. 298, pl. 2, fig. 9, and pl. 4, fig. 12) gives a colored figure of the larva and a black one of the pupa. Riley [?] (Amer. entom., Sept.-Oct., 1869, v. 2, p. 26) states that the larva eats raspberry [*Rubus* sp.]. Lintner (Entom. contrib., no. 2, 1872, p. 51-52) describes the early stages of the larva, which, he writes, has four molts (five stages), and feeds on *Quercus prinoides*. Packard (Bull. 7, U. S. entom. comm., 1881, p. 45) briefly describes the larva, and gives a few notes upon its habits. The larva feeds on *Betula alba*.

Hyperchiria io Fabr. (Syst. entom., 1775, p. 560). Harris (Rept. ins. injur. veg., 1841, p. 283-285) describes the larva and male and female imagos; later (Treatise on ins. injur. veg., 1862, p. 393-396) he adds to the descriptions figures of the larva, pupa, cocoon, and male and female imagos; and still later (Entom. corresp., 1869, p. 295-297) he gives a more extended description of the larva. Morris (Synop. lepid. N. A., 1862, p. 220) briefly describes the larva. Packard (Guide study ins., 1869, p. 299) gives brief notes on this species, under the name of *Hyperchiria varia* Walker. Bethune (Can. entom., Oct. 1869, v. 2, p. 19-20) briefly describes the larva, and Minot (*op. cit.*, Nov. 1869, v. 2, p. 28-29) describes egg and larva without recognizing the species. Lintner (Entom. contrib., no. 2, 1872, p. 146 149) describes the egg, the six larval stages, the pupa, and the cocoon. Riley (5th rept. state entom. Mo., 1873, p. 133) describes egg, larva in its six stages, cocoon, and imago of this species, figuring larva and male and female imagos; and (Can. entom., June 1873, v. 5, p. 109) describes the egg in detail. Reed (Can. entom., Dec. 1874,

v. 6, p. 227-229, and Ann. rept. Entom. soc. Ontario, 1874, p. 11-13) repeats Riley's figures, and describes the different stages very briefly. Grote (Can. entom., Sept. 1878, v. 10, p. 176) states that this species is double-brooded in the south. The food-plants, as compiled, in chronological order, from the above and from other notices of this species are as follows: *Populus balsamifera*, *Ulmus*, *Trifolium*, *Zea mays*, and, according to Abbot, *Cornus* and *Sassafras* [Harris, 1841]; *Quercus* and *Robinia viscosa* [Harris, 1869]; *Cornus florida* and *Liriodendron* [Morris]; *Humulus* [Freeman (Amer. entom., Oct. 1868, v. 1, p. 39)]; *Gossypium* and *Acer* [Packard]; *Salix* [Bethune]; *Populus tremuloides*, *Robinia pseudacacia*, and *Cerasus virginiana* [Lintner]; *Amorpha fruticosa*, *Baptisia*, *Prunus serotina*, and currant [Riley]; *Corylus avellana* [Reed]; *Betula*, *Comptonia asplenifolia*, apple, *Lespedeza*, *Symphoricarpus*, and *Fraxinus* [Goodell (Can. entom.. Sept. 1877, v. 9, p. 180)]; *Prinos verticillatus*, *Rubus villosus* and *R. canadensis* [Goodell (*op. cit.*, Apr. 1879, v. 11, p. 78)]; and *Trifolium pratense* [Pilate (Papilio, May 1882, v. 2, p. 67)]. The larva also eats *Betula alba*.

Attacus cecropia Linn. (Syst. nat., 1758, *ed. 10*, p. 809). Harris (Rept. ins. injur. veg., 1841, p. 279-280) describes the larva, imago and cocoon of this species; later (Treatise on ins. injur. veg., 1862, p. 385, 387-389) he adds figures of the larva, pupa, cocoon, and male imago; and still later (Entom. corresp., 1869, p. 294-295) he again describes the larva. Morris (Synop. lepid. N. A., 1862, p. 223-224) describes larva, cocoon, and imago. Trouvelot (Amer. nat., March 1867, v. 1, p. 31) gives a note on the cocoon. Riley (Amer. entom., Feb. 1870, v. 2, p. 97-102, and 4th ann. rept. state entom. Mo., 1872, p. 103-107) describes the eggs, and figures and describes the larva, pupa, cocoon, and male imago. Sprague (Can. entom., April 1870, v. 2, p. 82) describes the eggs. Saunders (Can. entom., Oct. 1871, v. 3, p. 149-155) figures and describes the larva, cocoon, and male imago. Lintner (Entom. contrib., no. 3, 1874, p. 125) describes the young larva. Worthington (Can. entom., Sept. 1876, v. 8, p. 165-166) notices some color-varieties of the imago. Gentry (Can. entom., March 1877, v. 9, p. 41-49) describes the egg, different stages of the larva, and cocoon. Grote (Can. entom., Sept. 1878, v. 10, p. 176) says this species is double-brooded in the southern United States. Packard (Bull. 7, U. S. entom. comm., 1881, p. 113) figures the larva. Neumoegen (Papilio, Jan. 1882, v. 2, p. 18) states that this species usually emerges from the pupal state at about 5 p.m.; Brodie (*op. cit.*, May 1882, v. 2, p. 83), on the contrary, states that the emergence normally takes place about 10 a.m. Riley and others state that the larva has five stages, but Wailly (Bull. Soc. acclim. France, May 1882, s. 3, v. 9, p. 266-267) writes that it has six stages. Brodie (Papilio, Feb. 1882, v. 2, p. 32-33) gives a list of 49 species of plants belonging to 20 genera on which the larva will feed: the genera are *Tilia*, *Acer*, *Negundo*, *Prunus*, *Spiraea*, *Crataegus*, *Pyrus*, *Amelanchier*, *Ribes*, *Sambucus*, *Ulmus*, *Quercus*, *Fagus*, *Corylus*, *Carpinus*, *Betula*, *Alnus*, *Salix*, and *Populus*. From other authors the following genera are compiled: *Berberis*, *Liriodendron*, *Syringa*, *Carya*, *Gleditschia*, *Rubus*, *Ceanothus*, *Ampelopsis*, *Cephalanthus*, *Fraxinus*, *Vaccinium*, and *Rosa*.

Attacus promethea Drury (Illus. nat. hist. . . . 1770, v. 2, pl. 11-12). Harris (Rept. ins. injur. veg., 1841, p. 280-281) describes larva, cocoon, and imago of this species, giving *Sassafras*, wild-cherry, *Azalea*, and *Cephalanthus* as food-plants; later (Treatise ins. injur. veg., 1862, p. 390-391) he repeats these descriptions, adding figures of the male and female imagos. Morris (Synop. lepid. N. A., 1862, p. 224-225) describes larva, cocoon, and imago, and adds *Laurus benzoin* to the food-plants. Trouvelot (Amer. nat., Mar. 1867,

v. 1, p. 31) gives a note on the cocoon, and adds *Syringa* to the food-plants. Minot (Can. entom., May 1870, v. 2, p. 100) compiles a list of the food-plants of the larva, adding to those mentioned above, *Berberis*, *Betula*, *Acer*, *Quercus*, sometimes *Thuja*, and *Pinus*, *Fagus*, apple, peach, plum, silver-bell [*Halesia*]. Riley (4th ann. rept. state entom. Mo., 1872, p. 121-123) describes the egg, five larval stages, and the cocoon, and figures larva, cocoon, and male and female imagos; he adds *Liriodendron* to the food-plants. Lintner (Entom. contrib., no. 3, 1874, p. 126) describes egg and young larva. W. H. Edwards (Psyche, Jan. [27 June] 1881, v. 3, p. 161, 171-174) discusses the variability in the number of molts of *A. prometheа*, showing that it molts, in West Virginia, only three times, thus having four stages. Brodie (Papilio, May 1882, v. 2, p. 83) gives a note on time of emergence, copulation, and oviposition of this species. Saunders (Can. entom., Dec. 1883, v. 15, p. 231-233) uses Riley's figures of larva, cocoon, and male and female imagos, and adds *Populus* to the food-plants of the larva.

Attacus polyphemus Fabr. (Species insector., 1781, v. 2, p. 168). Among the very numerous articles which have been published concerning this species the following are worthy of citation. Harris (Rept. ins. injur. veg., 1841, p. 278-279) describes larva, cocoon and imago; later (Treatise on ins. injur. veg., 1862, p. 384-386) he adds a figure of the imago, and (Entom. corresp., 1869, p. 294, pl. 4, fig. 17) a figure of the larva. Morris (Synop. lepid. N. A., 1862, p. 226-227) describes larva and imago, and (*op. cit.*, p. 209) describes the egg, which he mistook for that of *Smerinthus excaecatus*. Trouvelot (Amer. nat., 1867, v. 1, p. 30-38, 85-94, 145-149, pl. 5-6) gives an extended account of this species which he tried to rear, on a considerable scale, for its silk; he describes the egg, larva, pupa, and cocoon, and figures the larva, pupa, cocoon, and male and female imagos, as well as *Ophion macrurum*, a parasite of the larva; he says there are at least six varieties of the imagos. Packard (Guide study ins., 1869, p. 297, pl. 6-7) repeats Trouvelot's figures. Riley [?] (Amer. entom., March 1869, v. 1, p. 121-122) figures the imago and describes the larva and imago. Riley (4th ann. rept. state entom. Mo., 1872, p. 125-129) describes egg, larva, cocoon, pupa, and imago, and figures larva, pupa, cocoon, and male and female imagos; contrary to Trouvelot, who stated that there are six larval stages, Riley gives the number of molts as four, making five larval stages. Lintner (Entom. contrib. [no. 1], 1872, p. 6) gives a note on the coloration of the eggs, and (*op. cit.*, no. 3, 1874, p. 152) describes the egg. Gentry (Can. entom., May 1874, v. 6, p. 86) describes the normal form and a variety of the larva. Grote (Can. entom., Sept. 1878, v. 10, p. 176) states that this species is double-brooded in the south; Trouvelot (*l. c.*) was unable to raise two broods to maturity in Massachusetts, and Brodie (Papilio, April 1882, v. 2, p. 60) writes that, "in long and warm seasons about 50 per cent. are double brooded, but this is against the increase of the species, as cold weather usually sets in before the larvae are fully matured." Packard (Bull. 7, U. S. entom. comm., 1881, p. 48) figures the larva. Saunders (Can. entom., March 1882, v. 14, p. 41-45) figures and describes the larva, pupa, cocoon, and male and female imagos; he further figures *Ophion macrurum*, a parasite of the larva. Brodie (Papilio, May 1882, v. 2, p. 83) states that normally this insect comes from its cocoon at about 11 a.m. Wailly (Bull. Soc. acclim. France, May 1882, s. 3, v. 9, p. 265) gives some notes upon the larva and imago. A compilation of the food-plants results as follows: *Quercus*, *Ulmus*, *Tilia* [Harris, 1841 and 1862]; *Tilia americana* and *Rosa* [Harris, 1869]; *Acer*, *Salix*, *Populus*, *Corylus*, *Betula*, *Vaccinium* [Trouvelot]; *Carya*, *Juglans nigra*, *J. cinerea*, *Crataegus* (Amer. entom., 1869, v. 1, p. 121); *Quercus virens*, [Chambers (Amer. entom., March 1870, v. 2, p. 156)]; apple, quince,

plum, *Prunus virginiana*, *Platanus*, *Gleditschia* [Riley]; *Betula lenta* [Young (Can. entom., Oct. 1880, v. 12, p. 212)]; *Hamamelis virginica* [Kyle (*op. cit.*, p. 213)]; *Castanea vesca*, *Fagus* [Wailly (Journ. Soc. arts, 31 March 1882, v. 30, p. 528)]; *Tilia europaea*, *Crataegus coccinea*, *C. tomentosa*, *C. crux-galli*, *Amelanchier canadensis*, *Ribes cynosbati*, *Quercus alba*, *Q. macrocarpa*, *Q. rubra*, *Corylus americana*, *C. rostrata*, *Fagus ferruginea*, *Carpinus americana*, *Ostrya virginica*, *Carya tomentosa*, *C. amara*, *C. alba*, *Betula lenta*, *B. excelsa*, *B. alba*, *B. papyracea*, *Alnus incana*, *A. serrulata*, *Salix alba*, *S. humulis*, *Populus grandidentata*, *P. tremuloides* [Brodie (Papilio, April 1882, v. 2, p. 58-59)]. Chestnut, as a food-plant, is only mentioned by Wailly, who reared the larvae in England, but they are often found, in eastern Massachusetts, on *Castanea vesca*.

Attacus luna Linn. (Syst. nat., 1758, *ed. 10*, p. 210). Harris (Rept. ins. injur. veg., 1841, p. 277-278) describes larva, cocoon, and imago, and gives *Juglans* and *Carya* as food-plants; he repeats (Treatise on ins. injur. veg., 1862, p. 382-384) these descriptions, adding a figure of the cocoon and imago; later (Entom. corresp., 1869, p. 293-294, pl. 4, fig. 14) he describes and figures the larva, specifying the food-plants as *Carya porcina* and *Juglans cinerea*. Morris (Synop. lepid. N. A., 1862, p. 225-226) describes the larva and imago. Trouvelot (Amer. nat., Mar. 1867, v. 1, p. 31) gives a note on the cocoon, and adds *Quercus* and *Platanus* to the food-plants. Minot (Can. entom., Nov. 1869, v. 2, p. 27) describes the egg. Riley (4th ann. rept. state entom. Mo., 1872, p. 123-125) describes the egg and larva, which he states to have five stages, and figures larva, cocoon, and imago; among food-plants he mentions *Liquidambar*, *Fagus*, *Betula*, *Salix*, and plum. Lintner (Entom. contrib., no. 3, 1874, p. 126-128) describes the larva, which molts four times. Gentry (Can. entom., May 1874, v. 6, p. 86) describes the normal form of the larva, and a variety of it. Bunker (Can. entom., April 1875, v. 7, p. 63) mentions how to distinguish the cocoon of this species from that of *A. polyphemus*. Rogers (Can. entom. 1875, v. 7: Aug. p. 141-143; Oct., p. 199-200) describes egg, larva, cocoon, and imago. Thaxter (Psyche, Sept. [10 Nov.] 1876, v. 1, p. 194) adds *Ostrya virginica* and *Castanea* to the food-plants of the larva. Saunders (Can. entom., Feb. 1877, v. 9, p. 32-33) figures and describes the imago. Grote (Can. entom., Sept. 1878, v. 10, p. 176) states that this species is double-brooded in the southern United States.

Drepana sp. A pupa taken 5 July 1883, at Cambridge, Mass., upon *Betula alba*, upon which the larva had evidently fed, gave as imago, 16 July 1883, a species of *Drepana*.

Platypteryx bilineata Packard (Proc. Entom. soc. Phil., Nov. 1864, v. 3, p. 359). Packard (*l.c.*) writes "Dr. Harris has reared this rom the larva, which pupated July 25; imago Aug. 15." Harris (Entom. corresp., 1869, p. 142) gives a crude figure of the larva of some American species of *Platypteryx?*, and Packard (Guide study ins., 1869, p. 293) repeats this figure as that of a species of *Dryopteris*; no food-plant is mentioned by either author. The European species, *Platypteryx lacertula*, feeds on birch. The larva of *P. bilineata* is found upon *Betula alba*, in eastern Massachusetts, about the first of July and again early in September; hibernation takes place as pupa in the September brood. Dr. G. Dimmock will later describe the egg, larva and pupa of this insect in detail, but the following notes will suffice for the recognition of the larva and pupa. The full-grown larva is about 12 mm. long, tapering from the anterior to the posterior end, which latter terminates in a single point, turned upward, in place of the anal legs. The dorsal surface of each segment bears four tubercles, each supporting a single short hair. The arrangement of these tubercles is peculiar: segment 1 has small tubercles arranged thus . . . segments 2 and 3 each have large tubercles arranged • . . • (the head in each case su

posed to be upward); segments 4-10 each have small tubercles arranged .·. ; segments 11-12 each have two large and two small tubercles arranged •..• . The slight cocoon is made between leaves of the birch which the larva has drawn together for the purpose, and the pupa within it is densely covered with a white bloom.

Coelodasys unicornis Abb. & Smith (Nat. hist. lepid. ins. Ga., 1797, v. 2, p. 165, pl. 86). Harris (Rept. ins. injur. veg., 1841, p. 306-307) describes the larva of this species and gives as food-plants plum and apple, and adds to them, on authority of Abbot, *Prinos verticillatus*. Harris (Entom. corresp., 1869, pl. 2, fig. 8) gives a colored figure of the larva. Payne (Amer. entom., Oct. 1870, v. 2, p. 341) notes that the larva mimics partly dead and partly living margins of leaves. Lintner (Entom. contrib., no. 3, 1874, p. 131) describes and figures the larva, adding *Corylus americana* and *Prunus virginiana* to the previously known food-plants; his figure is copied in Amer. nat., Nov. 1874, v. 8, p. 691-692. Packard (Bull. 7, U. S. entom. comm., 1881, p. 136) adds *Crataegus* to the food-plants. The larva also feeds on *Betula alba*.

Notodonta concinna Abb. & Smith (Nat. hist. lepid. ins. Ga., 1797, v. 2, p. 169, pl. 85). Harris (Rept. ins. injur. veg., 1841, p. 307-309) describes larva and imago of this species, and gives as food-plants apple, cherry, plum, *Rosa* and *Crataegus;* this description is quoted by Morris (Synop. lepid. N. A., 1862, p. 242), and is repeated with figures of larva and imago (Treatise on ins. injur. veg., 1862, p. 425-426, pl. 6, fig. 11) and with a colored figure of the larva by Harris (Entom. corresp., 1869, p. 303, pl. 1, fig. 3). Riley (Amer. entom., Sept.-Oct., 1869, v. 2, p. 27) figures larva, pupa, and imago, and adds pear to the food-plants; Riley's figures are repeated by Saunders (Can. entom., July 1881, v. 13, p. 138-140). The larva also eats *Betula alba*.

Notodonta dictaea Linn. (Syst. nat., 1767, ed. 12, p. 826) [= *Pheosia rimosa* Packard (Proc. Entom. soc. Phil., Nov. 1864, v. 3, p. 358)]. Lintner (Entom. contrib., no. 4, 1878, p. 188-193) gives descriptions of the larvae and other notes on this species, for which, on authority of Stephens, he gives the food-plants *Populus*, *Salix*, and *Betula*.

Datana ministra Drury (Illust. nat. hist. 1773, v. 2, p. 25, pl. 14, fig. 3). Harris (Rept. ins. injur. veg., 1841, p. 311-312) describes the larva and imago, and this description is repeated, with the addition of a wood-cut of the larva and a colored figure of the imago, in his Treatise on ins. injur. veg., in 1862; he gives (Entom. corresp., 1869, p. 308-310, pl. 2, fig. 4) a description with colored figure of the larva. Grote and Robinson (Proc. Entom. soc. Phil., 1866, v. 6, p. 11-12) describe the imago and the larva with especial reference to distinguishing it from the larvae of other species of *Datana*. Harris (*l.c.*) gave as food-plants of the larvae, apple and cherry; Riley (Amer. entom., July-Aug., 1870, v. 2, p. 263) adds *Juglans nigra;* and Southwick and Beuttenmüller (Science record, 15 April 1884, v. 2, p. 133), in a list of the food plants of larvae of species of *Datana*, add, for *D. ministra*, *Quercus*, *Corylus*, *Carya*, *Crataegus*, *Robinia*, *Betula*, *Tilia*, *Castanea*, and *Fagus*. The eggs of this species, which are often found in groups beneath the leaves of *Betula alba*, are, at least in eastern Massachusetts, very often nearly all destroyed by a minute hymenopterous parasite.

Limacodes scapha Harr. (Rept. ins. injur. veg., 1841, p. 303). Harris (*l.c.*, and Treatise on ins. injur. veg., 1862, p. 420) describes the species as larva, which he states to live on *Juglans;* later (Entom. corresp., 1869, p. 300, pl. 3, fig. 8) he figures the larva, and adds apple to the food-plants. Walsh (Proc. Bost. soc. nat. hist., Feb. 1864, v. 9, p. 298-299) first describes the imago and says, "The larva fed on hickory leaves, but I have met with two specimens on the button-wood or sycamore." Packard (Guide study ins., 1869, p. 290 and Bull. 7, U. S. entom. comm., 1881,

p. 77) briefly describes the larva, cocoon and imago, figuring the last. A single larva of this species, taken on *Betula alba* at Belmont, Mass, 12 Aug. 1882, pupated 17 Sept., and emerged 1 July 1883. The excrement of the larva has a peculiar form, being cup-shaped, with a deep concavity, and comparatively thin walls which are somewhat shrivelled about the margin in drying. The larva, when disturbed, exhales an odor difficult to describe. A short time before pupation it turns whitish.

Phobetron pithecium Abb. & Smith (Nat. hist. lepid. ins. Ga., 1797, v. 2, p. 147, pl. 74). Harris (Rept. ins. injur. veg., 1841, p. 304-305) describes the larva and imago of this species, stating that the larva feeds on oak, and, according to Melsheimer, on wild cherry; later (Treatise on ins. injur. veg., 1862, p. 421-422) he adds to this description a poor figure of the larva and of the cocoon; he gives a brief note (Entom. corresp., 1869, p. 244-245) on the larva. Riley (Amer. entom. v. 2: Sept.-Oct. 1869, p. 25; Oct. 1870, p. 340) gives a good figure of the larva, which he states to feed on apple and Siberian crab-apple; he later (5th ann. rept. state entom. Mo., 1873, p. 126) gives this species in a list of larvae which have urticating power. Lintner (Entom. contrib., no. 3, 1874, p. 149) describes the cocoon, and adds plum, pear, and *Corylus americana* to the food-plants. This larva is rarely found in eastern Massachusetts and a little more abundant in the western part of the state; a favorite food-plant is *Betula alba*.

Orgyia leucostigma Abb. & Smith (Nat. hist. lepid. ins. Ga., 1797, v. 2, p. 157, pl. 79). Harris (Rept. ins. injur. veg., 1841, p. 261-263) describes the eggs, larva and imago of this species; apple and *Rosa* are given as food-plants. The same author (Treatise on ins. injur. veg., 1862, p. 366-368) figures and describes the eggs, larva, cocoon, and male and female imagos, and adds *Aesculus hippocastanum* to the food-plants; later (Entom. corresp., 1869, p. 291) he adds futher *Salix*, *Celtis* and *Carya* to the food-plants. Fitch (1st and 2nd rept. ins. N. Y., 1856, p. 202-22[illegible] describes the different stages of this speci[illegible] noting in addition to food-plants mentio[illegible] above, *Ulmus*, *Acer*, *Quercus*, and pl[illegible] Riley (1st ann. rept. state entom. Mo., 1 & th p. 144-147) figures and describes briefly fe- eggs, larva, pupa, cocoon and male an[illegible] male imagos; the figure of the larva is re- peated in Amer. entom., Sept. 1870, v. 2, p. 306. Saunders (Can. entom., Apr. 1871, v. 3, p. 14-15) repeats Riley's figure of the *larva*, and describes the egg and egg-mass. Packard (Bull. 7, U. S. entom. comm., 1881, p. 239) repeats Riley's figures of the different stages of this species. Coleman (Papilio, Nov.-Dec. 1882, v. 2, p. 164-166) describes some variations in the coloration of the larvae. Clarkson (Can. entom., Sept. 1883, v. 15, p. 168) mentions that this larva particularly attacks the silver-leaf *Populus*, and calls attention to the fact that ichneumons oviposit in cocoons of this species. The larva feeds upon *Betula alba* and *B. lenta*.

Hyphantria textor Harr. (N. E. farmer, 22 Aug. 1828, v. 7, no. 5, p. 34). Harris, Rept. ins. injur. veg., 1841, p. 254-255) describes the larva, cocoon and imago of this species, giving apple and *Ulmus* as food plants of the larva; later (Treatise on ins. injur. veg., 1862, p. 357-358, pl. 7, fig. 10-12) he repeats these descriptions and adds figures of larva, cocoon, and pupa. Morris (Synop.. lepid. N. A., 1862, p. 344) gives a brief description of larva and imago. Harris (Entom. corresp., 1869, p. 360) quotes the original descriptions of larva and imago Riley [?] (Amer. entom., Nov. 1869, v. 2, p. 39) gives as food-plants, *Carya*, *Prunus serotina*, apple, crab, *Fraxinus*, *Ulmus*, *Salix*, *Quercus*, *Betula* and *Platanus*. Riley (3rd ann. rept. state entom. Mo., 1871, p. 130-132) describes and figures larva, pupa, and imago, adding *Juglans*, *Quercus*, hop-plantain, *Phaseolus* and *Helianthus*. Riley's figures are given, with descriptions, by Saunders (Can. entom., Aug. 1873, v. 5, p. 141-143) and by Packard (Bull. 7, U. S.

entom. comm., 1881, p. 67). The larvae also feed on *Syringa vulgaris*, *Ribes rubrum*, and *Betula alba*.

Spilosoma virginica Fabr. (Syst. entom., Suppl., 1775, p. 437). Harris (Rept. ins. injur. veg., 1841, p. 247-248) describes the larva and imago, stating that the larva feeds on leaves of *Plantago*, *Pisum*, *Phaseolus*, *Zea Mays*, *gramineae*, *Vitis*, *Ribes rubrum* and *R. grossularia;* later (Treatise on ins. injur. veg., 1862, p. 349-351) he adds a figure of the larva and imago. and (Entom. corresp., 1869, p. 287-288) he describes the larva and pupa. Morris (Synop. lepid. N. A., 1862, p. 342-343) describes larva and imago. Riley (Amer. entom., July-Aug. 1870, v. 2, p. 272-273 and 3rd ann. rept. state entom. Mo., 1871, p. 68-69) describes and figures the larva pupa, and imago, adding to the above-mentioned food-plants, *Juglans cinerea*, *Syringa*, *Convolvulus*, *Gossypium*, *Helianthus*, *Polygonum*, *Verbena* and *Geranium;* he also states that the larva has been known "to subsist entirely, from the time it cast its last skin till it spun up, on dead bodies of the camel cricket (*Mantis carolina*)": later (*op. cit.*, Oct. 1870, v. 2, p. 336) he adds *Petunia* and *Salix* to the food-plants. Lintner (Entom. contrib., no. 3, 1874, p. 143) describes two varieties of the larva. Bates (Can. entom., Jan. 1880, v. 12, p. 20) adds *?Rumex* to the food-plants. Saunders (*op. cit.*, March 1880, v. 12, p. 56-57) reprints Riley's figures of the larva, pupa. and imago, and describes them. Packard (Bull. 7. U. S. entom. comm., 1881, p. 88-89) describes larva and imago (reprinting Riley's figures of these and the pupa) and adds *Rhamnus* and *Pinus* to the food-plants. The larva also eats *Ampelopsis quinquefolia*, *Ulmus americana*, *Betula alba*, *Fuchsia fulgens*. *Tropaeolum*, *Prunus serotina*, *Syringa vulgaris*, *Vitis labrusca*, *Ipomoea purpurea*, *Pelargonium*, *Martynia proboscidea*, *Acer saccharinum*, *Ricinus communis*, *Lappa officinalis*, and *Nicotiana tabacum*, but specimens fed on *Datura meteloides* died soon after.

Spilosoma isabella Abb.-Smith (Nat. hist. lepid. ins. Ga., 1797, v. 2, p. 131, pl. 66). Harris (Rept. ins. injur. veg., 1841, p. 252-253) describes larva and imago giving *Trifolium*, *Taraxacum dens-leonis*, and narrow-leaved *Plantago* as food-plants; to this he adds (Treatise on ins. injur. veg., 1862, p. 355-356) a figure of the larva. Walsh [?] (Pract. entom., June 1867, v. 2, p. 103) gives apple as a food-plant of the larva. Riley (Amer. entom., April 1870, v. 2, p. 182) figures and briefly describes the larva, pupa, and imago, mentioning only grass as a food-plant of the larva; later (4th ann. rept. state entom. Mo., 1872, p. 143-144) he reprints these figures. Riley's figures, with a brief description, are again repeated by Saunders (Can. entom., April 1873, v. 5, p. 75-77, and Ann. rept. entom. soc. Ontario, 1873, p. 22-23), and Westcott (Can. entom.,. July 1873, p. 137) adds a few notes on the larva. Siewers (Can. entom., July 1877, v. 9, p. 127-128) notes a few habits of the larva Mann (Psyche, Sept.-Dec. 1879 [9 Apr. 1880], v. 2. p. 270) gives some notes on the larva. Riley (Amer. entom., June 1880, v. 3, p. 133-134) reprints his figures of larva, pupa, and imago, and adds some notes on the larva and its parasites. Coleman (Papilio, Jan. 1882, v. 2, p. 18) gives some notes on the variations of color of the larva. Experiments show that the larva feeds readily on leaves of the following plants: *Ricinus communis*, *Acer saccharinum*, *Viburnum dentatum*, *Lappa officinalis*, *Polygonum persicaria*, *Tropaeolum majus*, *Vitis labrusca*, *Syringa vulgaris*, *S. persica*, *Ampelopsis quinquefolia*, *Prunus serotina*, *Ulmus americana*, *Clethra alnifolia*, *Martynia proboscidea*, *Helianthus annuus*, *Plantago major*, *Spiraea sorbifolia*, *Ribes aureum* and *Betula alba;* the larva refused *Solanum nigrum* and *Apios tuberosa*.

Ceratomia amyntor Hübn. (Samml. exot. schmett., 1806-1824, v. 2, Lepid. 2, Sph. 3, leg. 4, mand. B, pond. 4) [= *C. quadricornis* Harr. (Amer. journ. sci. and arts, July 1839. [s. 1], v. 36, p. 293)]. Harris (*l. c.*) describes the larva and imago; the same author (Rept. ins. injur. veg., 1841, p. 227-228) briefly describes the larva and imago, and later (Treatise

on ins. injur. veg., 1862, p. 323-324) adds a figure of the larva and imago; still later (Entom. corresp., 1869, p. 282) he briefly describes the egg, young larva, and pupa. Morris (Synop. lepid. N. A., 1862, p. 205-206) describes larva, pupa, and imago. Lintner (Proc. Entom. soc. Phil., Dec. 1862, v. 1, p. 286-293) gives an excellent description of the egg, the five stages of the larva, and the pupa. Minot (Can. entom., Nov. 1869, v. 2, p. 28) describes the egg and the young larva; he states that the larva molts six times. Andrews (Can. entom., Feb. 1876, v. 8, p. 40) and Bunker (*op. cit.*, June 1876, v. 8, p. 120) discuss the brown form of the larva. The before-mentioned authors give only *Ulmus* as food-plant; Goodell (Psyche, July [Dec.] 1882, v. 3, p. 368) gives *Ulmus* and *Betula alba* as food-plants. Taken in Cambridge, Mass. oftener on *Betula alba* than on *Ulmus*.

Smerinthus excaecatus Abb. & Smith (Nat. hist. lepid. ins. Ga., 1797, v. 1, p. 49, pl. 25). Harris (Amer. journ. sci. and arts, July 1839, [s. 1], v. 36, p. 290) gives a brief description of larva and imago of this species, which he states to feed upon apple and *Rosa carolina;* Morris (Syn. lepid. N. A., 1862, p. 209) gives Harris' description of the larva, with slight addition, and adds a description of the young larva, and of what he supposed to be the egg,— really, however, the egg of *Attacus polyphemus*. Harris (Treatise on ins. injur. veg., 1862, p. 327-328) describes and figures the imago. Lintner (Proc. Entom. soc. Phil., 1864, v. 3, p. 666) describes the larva, without knowing the species, and later (Entom. contrib., no. 2, 1873, p. 23) he gives its name, and states that the larva described by him (Proc. Entom. soc. Phil., 1864, v. 3, p. 665) as *S. excaecatus* was in reality *S. geminatus*. Sanborn (Can. entom., Jan. 1869, v. 1, p. 48) calls attention to the squeaking noise produced by the larva of this and of other species of *Smerinthus*. Lintner (Entom. contrib., [no. 1], 1869, p. 56) gives *Prunus pennsylvanica* and *Crataegus* as food-plants of the larva. Mann (Psyche, Sept.-Oct. 1877 [8 Mar. 1878], v. 2, p. 69-72) compares descriptions of the larva of this and of other species of *Smerinthus*, giving *Acer* as food-plant of the larva of *S. excaecatus*. Goodell (Psyche, July [Dec.] 1882, v. 3, p. 368) describes egg and first larval stage of this species. Fletcher (Can. entom., Nov. 1883, v. 15, p. 203-204) gives as food-plants apple, plum, wild cherry, *Populus balsamifera* and *P. alba*, and further states that the larvae varied much in coloration. Saunders (Can. entom., Jan. 1884, v. 16, p. 9-11) describes and figures the last stage of the larva and the imago. Fischer (*op. cit.*, p. 17) adds *Tilia* and *Salix* to the food-plants. In Cambridge, Mass., the larva of this species is not rare on low shrubs of *Betula alba*, where it occurs throughout August and September. The larvae, as observed on *Betula alba*, exhibit no variation. They are somewhat difficult to rear; of 38 larvae, of which rearing was begun, 8 were put in alcohol for preservation; three produced imagos (2 ♂ and 1 ♀); 16 died without apparent parasitism, while 11 were killed by *Thyreodon morio*, of which ichneumon only 2 reached the imago state. One of the pupae of *Thyreodon* produced a large number of minute hymenoptera — secondary parasites. The egg of *S. excaecatus* often harbors very minute hymenopterous parasites; more than thirty of these hymenoptera sometimes emerge from a single egg of *Smerinthus*, a fact that will give an idea of their microscopical minuteness.

Limenitis arthemis Drury (Illust. nat. hist. . . . 1773, v. 2, pl. 10, fig. 3-4). Lintner (Proc. entom. soc. Phil., May 1864, v. 3, p. 62-63) describes the larva and pupa of this species, giving as larval food-plant *Populus balsamifera* Scudder (Amer. nat., Aug. 1869, v. 3, p. 330) gives *Crataegus* as food-plant, and again (Psyche, Aug. 1874, v. 1, p. 13) adds *Betula lenta* and *Populus* to the food-plants.

Vanessa antiopa Linn. (Syst. nat., 1758, *ed. 10*, p. 476). Besides numerous references in European literature, in which *Salix*, *Populus*, *Betula* and *Tilia* are noticed as food-plants, the following citations of American

authors may be mentioned. Harris (Rept. ins. injur. veg., 1841, p. 219, and Entom. Corresp., 1869, p. 280) describes the larva of this species, adding *Ulmus* as food-plant; Peter (Treatise on ins. injur. veg., 1862, p. 296-298) he figures and describes larva, pupa, and imago. Packard (Guide study ins., 1869, p. 258) and Saunders (Can. entom., April 1869, v. 1, p. 75) describe the larva.

Papilio turnus Linn. (Mantissa, 1767, v. 1, p. 536). Harris (Treatise on ins. injur. veg., 1862, p. 268-269) describes and figures the larva and imago of this species, which is stated to feed on wild cherry. Morris (Synop. lepid. N. A., 1862, p. 2) describes larva and imago, giving for food-plant "various species of *Prunus*." Saunders (Can. entom., Feb. 1869, v. 1, p. 53-54) describes egg and young larva, and later (*op. cit.*, Apr. 1869, v. 1, p. 74) describes adult larva. Scudder (Amer. nat., Aug. 1869, v. 3, p. 330) gives as food-plants: apple, *Crataegus*, *Prunus virginiana*, cultivated cherry, *Alnus*, *Liriodendron tulipifera*, *Fraxinus sambucifolia*, *Betula*, *Tilia* and *Quercus*, and later (Can. entom., May 1872, v. 4, p. 84), on authority of Abbot, gives *Fraxinus trifoliata* and *F. ?platycarpa*. Saunders (Can. entom., Jan. 1874, v. 6, p. 2-5) describes and figures larva and imago, and (*op. cit.*, Nov. 1883, v. 15, p. 204) adds *Magnolia acuminata* to the recorded food-plants. Gruber (Papilio, May 1884, v. 4, p. 86-87) gives notes on the five stages of the larva.

Coleoptera.

Chlamys plicata Fabr. (Entom. syst., Suppl., 1794, p. 111). This species is sometimes found feeding, as imago, on *Betula alba*. The larvae feed on *Quercus*, *Platanus*, *Rubus* and *Comptonia asplenifolia*. Riley (6th. ann. rept. state entom. Mo., 1874, p. 128-129) describes egg, larva and pupa; and Packard (Guide study insects, 1869, p. 510) describes and figures the larva and its case.

Gonioctena pallida Linn. (Syst. nat., 1758, *ed. 10*, p. 370). Cornelius (Entom. zeit. . . . zu Stettin, 1850, jahrg. 11, p. 19-20) describes the larva of this species, which, according to Gyllenhal, among other plants, feeds upon *Betula alba*.

Syneta tripla Say (Journ. Acad. nat. sci. Phil., 1827, v. 5, p. 281) eats leaves of *Betula*, according to Fitch (Ann. rept. N. Y. state agric. soc., 1858, v. 18, p. 853). Packard (Bull. 7, U. S. entom. comm., 1881, p. 128) briefly describes this beetle.

Tylonotus bimaculatus Hald. (Trans. Amer. philos. soc., 1847, v. 10, p. 38) is said by Packard (Bull. 7, U. S. entom. comm., 1881, p. 129) on authority of G: Hunt, to be found "Under bark of white or paper birch, northern New York."

Gracilia minuta Fabr. (Spec. ins., 1781, v. 1, p. 235). Lugger (Psyche, Aug.-Sept. 1884, v. 4, p. 204) mentions breeding this species from a band of wood (*Betula lenta*) around a gin-barrel.

Bellamira scalaris Say (Journ. acad. nat sci., 1827, v. 5, p. 278-279). Packard (Bull. 7, U. S. entom. comm., 1881, p. 129) writes, on authority of G: Hunt, "Beetle and pupa found under the bark of the yellow birch in July, northern New York."

Clytus? Packard (3rd rept. U. S. entom. comm., 1883, p. 259; pl. 12, fig. 3) mentions and figures the mouth-parts of a larva from "black birch, "nearly allied if not identical with *Xylotrechus colonus*."

Aphrastus taeniatus Gyll. (Schönh., Synon. insectorum, Gen. et spec. curcul., 1834, t. 2, p. 460). Good description in Le Conte and Horn's Rhynchophora of Amer. north of Mex. (Proc. Amer. philos. soc., 1876, v. 15), p. 99. This species is not rare in Cambridge, Mass., on *Betula alba*.

Dendroides concolor Newm. (Entom. mag., 1838, v. 5, p. 375). G: Dimmock has a specimen in his collection, which he reared from the bark of *Betula papyracea* at the White Mts., N. H., the beetle emerging 8 July 1874.

Dendroides canadensis Latreille (Consid. genér., 1810, p. 212). Schaupp (Bull. Brooklyn entom. soc., July 1881, v. 4, p. 23) writes of this species, "Pupae in birch July 19, in beech July 23." G: Dimmock found a pupa

of this species, 30 June 1874. under decayed bark of *Betula papyracea*, on Mt. Washington, N. H.; the beetle emerged from this pupa 8 July 1874.

Meracantha contracta Beauv. (Ins. Afr. et Amer., 1805, p. 121, pl. 30, fig. 2). Haldeman (Proc. Amer. assoc. advanc. sci., 1850, v. 2, p. 347) briefly notices the larva of this species. Specimens in the collection of G: Dimmock were taken at Suffield, Conn., by Leroy H. Sykes, in decaying bark of *Betula lutea*.

Bolitotherus bifurcus Fabr. (Entom. syst., Suppl., 1794, p. 40). The larvae, pupae and imagos of this species are found in *Polyporus betulinus*, which grows on dead birch trees. Larva, pupa, and a male imago are figured by Packard (Guide study ins., 1869, p. 474). Kirby, as quoted by Bethune (Can. entom., Nov. 1873, v. 5, p. 211), says that this species is found in a boletus of the birch. Some habits of this beetle are mentioned by Harrington (Can. entom., Dec. 1882, v. 12, p. 260-261). Candèze (Mém. soc. sci. Liége, 1861, v. 16, p. 365-368, pl. 3, fig. 9) gives a detailed description of the larva, with figure; and Hayward (Bull. Bost. zool. soc., July 1882, v. 1, p. 35-36) briefly describes the larva and pupa.

Hoplocephala bicornis Fabr. (Gen. ins. mant., 1777, p. 215). This insect feeds upon different kinds of fungi, some of them parasitic on decaying wood of *Betula*. Kirby's description of the imago is quoted by Bethune (Can. entom., Nov. 1873, v. 5, p. 210-211). Harrington (*l. c.*, Dec. 1880, v. 12, p. 261) mentions its fungivorous habits.

Diaperis hydni Fabr. (Syst. eleuth., 1801, v. 2, p. 585). This species, both as larva and imago, feeds upon *Polyporus betulinus*, a fungus that grows on dead trees of *Betula alba*, and the beetles, according to G: Dimmock, are often very abundant about the first of July. Harrington (Can. entom., Dec. 1880, v. 12, p. 261) briefly describes the imago.

Centronopus calcaratus Fabr. (Entom. syst., Suppl., 1794, p. 52). Coquillett (Can. entom., June 1883, v. 15, p. 102) describes this larva very briefly. This larva is often very abundant in decaying birch wood.

Nyctobates pensylvanica De Geer (Mém., 1775, v. 5, p. 52; pl. 13, fig. 10). Schaupp (Bull. Brooklyn entom. soc., July 1881, v. 4, p. 23) writes of this species, "Pupae in beech July 15; in hemlock July 18; in birch July 21."

Phellopsis obcordata Kirby (Fauna bor.-amer., 1837, pt. 4, p. 236). The larva of this species has been found by G: Dimmock, on Mt. Washington, N. H., in *Polyporus betulinus*, the large white fungus common on dead trees of *Betula alba*. The imago frequents the same fungus during June, July, and August.

Telephorus bilineatus Say (Journ. Acad. nat. sci. Phil., 1823, v. 3, p. 182). Packard (1st ann. rept. inj. and benefic. ins. Mass., 1871, p. 26-28, pl. 1, fig. 7-8) describes and figures larva and imago and writes that the pupa of this species "early in May becomes a beetle, when it eats the newly expanded leaves of the birch." Riley (4th ann. rept. state entom. Mo., 1872, p. 29-30) describes and figures the larva and imago, stating that the larva has been found to eat larvae of *Carpocapsa pomonella*.

Campylus denticornis Kirby (Fauna bor.-amer., 1837, pt. 4, p. 145). G: Dimmock has reared this species from larvae found in partly decayed bark of *Betula papyracea*, on Mt. Washington, N. H. The imagos emerge from the pupae about 1 July, and are abundant during July in the White Mts.

Melanotus ? parumpunctatus Melsh. (Proc. Acad. nat. sci. Phil., Nov. 1844, v. 2, p. 151-152). A *Melanotus*, probably this species, was taken in the same cavity with its pupal skin, in decaying wood of *Betula alba*, at Milton, Mass., 17 Oct. 1884.

Melanotus ? communis Gyllenhal (Schönh., Syn. ins., v. 1, pt. 3; App. 1817, p. 138-139.) A *Melanotus*, probably this species, was taken in decaying wood of *Betula alba*, at Milton, Mass., 17 Oct. 1884.

Elater protervus LeConte Trans. Amer. philos. soc., 1853, s. 2, v. 10, p. 471). Two

specimens of this beetle were taken, 17 Oct. 1884, at Milton, Mass., in decaying wood of *Betula alba*, under circumstances that left no doubt that they bred in the wood.

Elater nigricollis Herbst (Natursyst.... ins.; Käfer, 1806, v. 10, p. 73, pl. 164, fig. 7). Coquillett (Can. entom., June 1883, v. 15, p. 101) briefly describes the larva, which he obtained from decayed wood of *Quercus*. Reared from decayed wood of *Betula alba*, the beetle emerging 3 May 1883 from wood collected the preceding April, in Cambridge, Mass.

Chrysobothris sexsignata Say (Trans. Amer phil. soc., 1839, v. 6, p. 158). Packard (Bull. 7, U. S. entom. comm., 1881, p. 128) writes of this species, "Beetle and pupa found in the yellow birch June 1, Providence."

Ceruchus piceus Weber (Observ. entom., 1801, p. 84). The pupae are mentioned by Fuchs (Bull. Brooklyn entom. soc., Dec. 1882, v. 5, p. 59) as being very common in an old beech stump, and are briefly described. The larvae are mentioned by G: Dimmock (Direct. collect. coleopt., 1872, p. 20) as living "in decayed chestnut and willow." The larvae are very abundant in decayed and fallen wood of *Betula alba* during autumn. Quite a large number of larvae taken in Milton, Mass., 10 Nov. 1883, fed through the winter and produced a single beetle. From these larvae were reared seven tachinid flies (allied to *Morinia*), which emerged from 4 June to 6 July 1884. The digestive tract of the larva of *C. piceus* is often inhabited by a microscopic undescribed nematod worm.

Macrodactylus subspinosus Fabr. (Syst. entom., 1775, p. 39). This beetle devours the leaves of *Betula alba*. Its metamorphoses were described by Harris (Mass. agric. repos. and journ., 1827, v. 10, p. 1-12), and many subsequent descriptions and figures have been given, among which may be mentioned Fitch (1st and 2nd rept. ins. N. Y., 1856, p. 245-252), Packard (Guide study ins., 1869, p. 454), Riley (5th ann. rept. state entom. Mo., 1873, p. 108-110), Thomas (6th rept. state entom. Ill., 1877, p. 103) and Lintner (1st ann. rept. state entom. N. Y., 1882, p. 227-232).

Dichelonycha elongatula Schönh. (Synon. insectorum, 1817, t. 1, theil 3, p. 210). Packard (Guide study ins., 1869, p. 454) says this species "is found in June on the leaves of the birch."

Thymalus fulgidus Erichson (Germar zeits., 1844, bd. 5, p. 458). G: Dimmock (Direct. collect. coleopt., 1872, p. 19-20) writes "The larvae feed upon a fungus (*Polyporus betulinus*) which is parasitic upon the trunks of white birch trees." This beetle is common in New England, and its larva agrees very closely with the description and figure of the larva of *T. limbatus* from Europe, as given by Chapuis and Candèze (Mem. Soc. sci. Liége, 1855, v. 8, p. 417-419, pl. 2, fig. 6). A large number of larvae, taken in Belmont, Mass., produced beetles after a short period of pupation, on or about 27 June 1878.

Trogosita corticalis Melsh. (Proc. Acad. nat. sci. Phil., Oct. 1844, v. 2, p. 109). Schaupp (Bull. Brooklyn entom. soc., July 1881, v. 4, p. 23) writes of this species, "Larvae in birch July 8, in beech Aug. 14, in sugar maple July 19."

Ips sanguinolentus Oliv. (Entom., 1780, v. 2, no. 12, p. 8; pl. 2, fig. 14). G· Dimmock (Can. entom., April 1871, v. 3, p. 15) notes that he found this species "about fresh-cut maple and birch stumps where the sap was flowing."

Ips fasciatus Oliv. (Entom., 1780, v. 2, no. 12, p. 7-8; pl. 2, fig. 13). G: Dimmock (Can. entom., April 1871, v. 3, p. 15) mentions that this species is found about fresh-cut stumps of *Betula* where the sap is flowing.

HYMENOPTERA.

Tremex columba Linn. (Syst. nat., 1758, *ed. 10*, p. 929). Harris (Rept. ins. injur, veg., 1841, p. 389-391) describes the egg, larva, and imago of this insect, giving wood

of pear, *Ulmus* and *Platanus* as food of the larva; and (Entom. corresp., 1869, p. 360) again describes the egg and imago. In Amer. entom., Nov. 1868, v. 1, p. 59, this species is mentioned as injuring oak and pear trees. Packard (Guide study ins., 1869, p. 228) quotes Harris' account of the habits of this species. Huggins (Amer. entom., Feb. 1870; v. 2, p. 128) found this insect ovipositing in an apple tree. Packard (Bull. 7, U. S. entom. comm., 1881, p. 105-106) figures the larva, which he states to attack *Ulmus*, *Quercus*, *Acer* and *Platanus;* and (*op. cit.*, p. 129) says, "In yellow birch at Providence," R. I. Harrington (Can. entom., Dec. 1882, v. 14, p. 225) gives some notes upon this species and adds *Fagus* to the food-plants.

Croesus latitarsus Norton (Proc. Entom soc. Phil., 1862, v. 1, p. 199). Norton (*l.c.*) describes the male of this species and later (Trans. Amer. entom. soc., 1867, v. 1, p. 84) describes the female, and adds, "Bred by Mr. Walsh from larvae feeding on birch."

Xyphidria attenuata Norton (Proc. Entom. soc. Phil., 1862, v. 1, p. 144). Norton (*l.c.*, and Trans. Amer. entom. soc. 1869, v. 2, p. 354) describes the male of this species, and Patton (Can. entom., Jan. 1879, v. 11, p. 14-15) describes the female. Patton (*l.c.*) writes of his specimen, "Taken from a dead stick of *Betula nigra*," and mentions that *Rhyssa humida* is a parasite of this species.

NEW SOLVENT OF CHITIN.— Dr. Looss, assistant in the Zoological institute at Leipzig, has found that a solution of sodic hypochlorite (*eau de Labarraque* of the druggists), or of potassic hypochlorite (*eau de Javelle*), is a fine solvent for chitin in making microscopical preparations. He writes (*Zool. anzeiger*, 1 June 1885, jahrg. 8, p. 334):

"The liquid, as bought, completely dissolves, when heated, even the solidest and hardest chitinous parts of insects in a short time, first making them glass-like, transparent, and entirely colorless. If the liquid is diluted with six or seven times its volume of water, and the chitinous parts, either fresh or after they have been hardened, are put in it for twenty-four hours, or even longer according to size, the chitin will be altered, altho not noticeably externally; it loses much of its original brittleness, and above all things is more permeable to staining solutions. The objects require, for complete staining greater or less time according to size, but the coloration is beautiful and distinct with either alcoholic or aqueous staining reagents. In our Institute *pediculidae* and *mallophaga* have been prepared by this method which show, besides their great transparency, complete and clear coloration. This is likewise the case with nematodes and their eggs. It is furthermore especially remarkable that by this treatment the underlying soft parts are entirely spared and admit studying upon them the finest structural relationships, such as the elementary structures of striate muscular fibres ('Muskelkästchen') and the nerve endings. Sections of bees' heads have been made which were as beautiful as could be desired. At all events this reagent deserves to be experimented with further."

PSYCHE.

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HERBERT KNOWLES MORRISON.

Born 24 Jan. 1854, at Boston, Mass.
Died 15 June 1885, at Morganton, N. C.

Herbert Knowles Morrison was the eldest of the six children of William Albert and Mary Elizabeth Morrison (née Butler), of Cambridge, Mass. In early life he showed an observing and practical turn of mind, and when not more than twelve years of age employed all his time out of school in hunting for insects. In later years he made a special study of noctuid moths, preparing his specimens with great neatness; and from 1873 to 1875 he contributed largely to the literature of that subject in this country. After 1876 he published little, and apparently nothing later than 1883. He was one of the original members of the Cambridge entomological club, and was also a member of the Boston society of natural history. He was a member of the first excursion party of the Cambridge entomological club to Mount Washington, in 1874, and seems to have determined from his experience at that time to devote himself entirely to the collection and sale of insects as a means of gaining his livelihood. He was a most diligent and energetic collector, as was shown by his success in 1875, when he returned to the White Mountains early in the season, and came back late with 20,000 specimens. In 1876, he visited the southern United States expressly to explore the field which John Abbot had made famous. His captures there were doubly successful, for he found occasion to return there the next year to be married, and he made his home there ever after. In 1874 he collected insects in Colorado, in 1878 in Nevada, in 1879 in Washington territory, near the close of the season losing his entire collection and outfit by fire, in 1880 in Washington territory and southern California, in 1881 in Arizona and southern California, in 1882 in New Mexico, in 1883 in Florida, in 1884 near Key West, Fla., and later in Nevada, in the spring of 1885 at Key West where he had an attack of dysentery which proved fatal. He was a very muscular man, and endowed with wonderful powers of endurance, which he tasked to the utmost. The physician who attended him in his last illness, and who had been an army surgeon, said that Morrison had the finest physique of any man he ever saw. Not infrequently he would walk forty miles a day in pursuit of insects, and than would take care of them before he slept, filling up the time while thus engaged in capturing the moths that were attracted to his light. His collections have furnished abundant material for the studies of many entomologists in America and in Europe. A widow and two daughters survive him. *B: P. M.*

PROCEEDINGS OF SOCIETIES.

LINNEAN SOCIETY OF NEW SOUTH WALES.

29 AUG. 1883.— . . . The president [C. S. Wilkinson, government geologist] exhibited some specimens of fossil insects found in the tin-bearing tertiary deep leads near Vegetable

Creek, New England. This is the second discovery of fossil insects in Australia, and the specimens show the impressions of larvae and pupae of *Ephemera* or "May-fly."

26 Nov. 1884.— . . . On the larvae and larva cases of some Australian *aphrophoridae*. By F. Ratte, M.E. This paper describes the larval state of some small species of rhynchota closely allied to the genus *Aphrophora* and belonging probably to the genus *Ptyelus*. They are as yet imperfectly known; but the description of their larva-cases and of some of the larvae discloses a feature probably quite new to the science of entomology. These cases, unlike those of insects generally, are true shells, containing at least three-fourths of carbonate of lime, and resembling in shape some fossil and recent serpulae, some being conical, others serpuliform, or helicoidal. The conical shells are fixed on the branches of some species of eucalyptus, the mouth turned upwards, the larva being placed in it with the head downwards. It introduces its suctorial apparatus into the bark of the stem, sucks the sap of the tree, and emits from time to time, by its anus, drops of clear water. This property of emitting water is possessed by all the family.

The president exhibited four specimens of the shell-like covering of a species of *Phryganea*. These are built up entirely of small round nodules of brown iron ore, fastened together by a silky web. They were obtained on the north end of New Caledonia, by Dr. Storer, in a creek flowing over rocks composed of iron ore.

31 Dec. 1884.— . . . Mr. E. P. Ramsay, F.R.S.E., exhibited for Mr. E. G. W. Palmer a native bees' nest which had been obtained in the neighborhood of Smithfield. For the last seven years it had been suspended from a branch of a pear tree in Mr. Palmer's garden, and a quart of honey had often been obtained from it, but during the last winter a caterpillar formed its cocoon in the only aperture and so effectually closed it that all the bees were killed.—Selected from *Zoologischer anzeiger*.

OBSERVATIONS ON DECAPITATED SILKWORM MOTHS.

N. Passerini finds that decapitated silkworm moths live a long time, but are torpid, move with difficulty and only under direct external excitation, and often disconnect themselves if they are paired. They live longer than those which have not been decapitated; often living for more than a month, whereas normally the males die in six or seven days after they have issued from the chrysalis. The females live even longer than the males, but do not lay eggs. In one case three or four eggs were obtained from a female which had been decapitated while coupled with a male whose head had been left on, but although these eggs appeared to be fecundated, they did not hatch in the following year. The moths did not couple after both had been decapitated, but if the female alone was decapitated copulation did sometimes take place. If they were decapitated while coupled they very often separated; but sometimes they remained connected, without moving, until they died. If the male only was decapitated while coupled, they separated; but this was not the case if the female only was decapitated. This is readily understood, since the male holds the female by a special genital armature. Death does not follow decapitation instantly because the principal nervous centre does not reside in the head. Life is prolonged because the vital force of the insect is not consumed in the procreation of new individuals. The author could not find a satisfactory explanation for the failure of the decapitated females to lay their eggs, since the female normally lays all or nearly all her eggs even if they are not fecundated, but he thinks that possibly the ganglia of the oesophageal ring operate, or at least regulate the emisson of eggs in this insect.— Summarized from "Passerini, N. Esperienze sulla decapitazione delle farfalle del baco da seta" (Bull. soc. entom. ital., 31 Dec. 1884, an. 16, p. 285-286).

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nichoias; O: Otto; P: Peter; R: Richard: S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Balbiani, E. G. Sur l'origine des cellules du follicule et du noyau vitellin de l'oeuf chez les géophiles. (Zool. anzeiger, 1883, jahrg. 6: 10 Dec., p. 658-662; 24 Dec., p. 676-680; 10 fig.)

Notice, by P. Mayer. (Zool. jahresb. für 1883, 1884, abth. 2, p. 1, 8.)

States that there is a genetic connection between the cells of the follicle and the nucleus of the egg. In *geophilus longicornis* the cells are produced at the end of a kind of stolon formed by a prolongation of the nucleus; in *g. carpophagus* they arise by a process of budding at several points of the surface of the nucleus.

E: L. M. (3788)

Chatin, Joannes. Note sur la structure du noyau dans les cellules marginales des tubes de Malpighi chez les insectes et les myriapodes. (Annal. sci. nat., 1882 [Jan. 1883], s. 6, v. 14, no. 3, p. 1-7, pl. 19 B.)

The intimate structure of the nucleus in the marginal cells of the malpighian tubes, especially the structure of the moniliform nuclear cord and its relation to the nucleoli, are discussed and illustrated by figures from *iulus, gryllotalpa, carabus, papilio* and *apis*. There is an intimate connection (continuity?) between the cord and the nucleoli in which it terminates. The monilation may appear like surposed globules, or dark disks alternating with clear spaces, which may be transverse or inclined so as to appear like a spiral. The last condition may be natural or may result from a shifting of the disks due to treatment; according to the latter hypothesis the cord must have a limiting membrane.

E: L. M. (3789)

Cresson, Ezra Townsend. Catalogue of a collection of hymenoptera made by Prof. F. Sumichrast near Cordova, Mexico. Part 1. (Trans. Amer. entom. soc., May 1868. v. 2, p. 1-38.)

Notice, by A. S. Packard, *jr.* (Record of Amer. entom. for 1868. 1869, p. 1, 4-5.)

Introductory remarks on the excellence and zeal of F. Sumichrast as a collector, the paucity of European writings on American *hymenoptera terebrantia*, the difficulties of the study of these insects, especially the *entomophaga*, and the merging of the characters of *ichneumon, hoplismenus, joppa* and *trogus*; synopses of groups and descriptions of species of 38 (37 new) *ichneumon*, 13 new *hoplismenus*, 3 new *oedicephalus* (n. g.), 8 (7 new) *joppa*, 1 new *stilpnus*, 7 new *mesoleptus*, a new *tryphon*, 2 new *exochoides* (n. g.), 3 new *exochus*, collected by F. Sumichrast near Cordova, Mexico.

B: P. M. (3790)

Cresson, Ezra Townsend. Catalogue of a small collection of hymenoptera made in New Mexico during the summer of 1867. (Trans. Amer. entom. soc., Jan.-Feb. 1868, v. 1, p. 375-388, 1 fig.)

Describes *urocerus areolatus* (and figures fore wing), *scolia* (*discolia*) *leconteí, s.* (*d.*) *flavocostalis, coloptera wrightii, gorytes propinquus, g. tricolor, odynerus rufinodus, o. toas, pterochilus lewisii, polistes navajoe, p. flavus, andrena mellea, nomia nortoni, n? apacha, perdita? albipennis, anthidium occidentale, a. atrifrons*, and *melissodes menuachus*, all new species, and gives a list of some other species collected in New Mexico and neighboring territories; *scolia regina* ♀ = *elis xantiana* ♀, *s. flavosignata* ♂ may be = *e. xantiana* ♂, in which case *s. consors*‡ Cress. must be named *e. zonaria* n. sp.; *s. ridingsii* may be *s. nobilitata* var. *B: P. M.* (3791)

Cresson, Ezra Townsend. Catalogue of hymenoptera in the collection of the Entomological society of Philadelphia, from Colorado Territory. (Proc. Entom. soc. Philad., 1865, v. 4: April, p. 242-313; June, p. 426-488.)

Notice. (GERSTAECKER. A. Bericht . . . 1865-1866, hälfte 2, 1869, p. 5, 21, 22, 25, 26, 29, 33, 36, 43.)

Enumerates 205 (194 new) species of hymenoptera, in general of all families except *vespariae* and *apiariae*, from Colorado, with synonymical references, and describes the new species; describes *ceratosoma* and *tenthredoides*, 2 new genera of *ichneumonidae*.

B: P. M. (3792)

Cresson, Ezra Townsend. Catalogue of North American *apidae*. (Trans. Amer. entom. soc., Feb.-Mch. 1879, v. 7, p. 215-232.)

Systematic list of the *apidae* of North America, including Central America and West Indies, with reference to original descriptions and to habitats of the species; comprises 45 genera and 632 species.

B: P. M. (3793)

Cresson, Ezra Townsend. Description of a new species of *masaris* from California. (Trans. Amer. entom. soc., May 1872, v. 4, p. 87-88.)

Describes *masaris edwardsii* ♀ ♂ n. sp., from California.

B: P. M. (3794)

Cresson, Ezra Townsend. Description of a new species of *masaris*, from the Rocky Mountains. (Proc. Entom. soc. Philad., June 1863, v. 2, p. 69-74, pl. 4.)

Describes *masaris vespoides* n. sp. ♂ ♀ and ♀ variety from Colorado and institutes a comparison with *m. vespiformis*, "the type of the genus"; points out errors in the figures. *B: P. M.* (3795)

Cresson, Ezra Townsend. Descriptions of new North American hymenoptera in the collection of the American entomological society. (Trans. Amer. entom. soc., Mar. 1878, v. 7, p. 61-136, il.)

Describes 8 species of *panurgus*, 15 *calliopsis*, 5 *perdita*, 4 *macrotera*, 31 *nomada*, 2 *osiris*, 4 *phileremus*, 19 *epeolus*, *crocisa*? *lata*, 3 *melecta*, 5 *stelis*, *coelioxoides* n. g., *c. punctipennis*, 10 *coelioxys*, 18 *osmia*, *heriades*? *denticulatum*, *chelostoma californicum*, *alcidamea truncata*, 23 *anthidium*, 37 *megachile*, 4 *ceratina*, *xylocopa azteca*, 5 *exomalopsis*, 7 *tetrapedia*, in all 1 new genus and 213 (212 new) species of *apidae* from North America, mostly described in but one sex and from not more than three specimens; *epeolus mercatus* re-described; figures the neuration of fore wing of *coelioxoides*, and characteristic structural details of 11 species of *coelioxys*, 2 of *osmia*, 6 of *anthidium*, and 1 each of *heriades*? and *alcidamea*. *B: P. M.* (3796)

Cresson, Ezra Townsend. Descriptions of new North American hymenoptera in the collection of the American entomological society. (Trans. Amer. entom. soc., Feb. 1879, v. 7, p. 201-214.)

Describes 3 species of *calliopsis*, *perdita zonalis*, 4 *nomada*, *phileremus*? *productus*, 3 *melecta*, *stelis interrupta*, 2 *heriades*?, 8 *anthidium*, 4 *megachile*, 2 *melissodes*, 8 *anthophora*, 2 *xylocopa*, 3 *centris*, *apathus*? *californicus* and *panurgus nevadensis*, in all 43 new species of *apidae* from North America; describes also 2 new varieties; *calliopsis lateralis* is a variety of *c. edwardsii*. [Cont. from p. 136, and on p. 255.] *B: P. M.* (3797)

Cresson, Ezra Townsend. Descriptions of new North American hymenoptera in the collection of the American entomological society. (Trans. Amer. entom. soc., May 1879, v. 7, p. 255-256.)

Describes 5 new species of *aulacus* from Colorado and Nevada, and 1 from Vancouver's Island *B: P. M.* (3798)

Cresson, Ezra Townsend. Descriptions of new species belonging to the sub-family *pimplariae* found in America north of Mexico. (Trans. Amer. entom. soc., Sep. 1870, v. 3, p. 143-172.)

Describes *acoenites rupinsulensis* Walsh, 2 species of *ephialtes*, *epimecis wiltii*, 15 *pimpla*, 3 *polysphincta*, *dictyopyga annulipes*, 22 *glypta*, *schizopyga frigida*, 3 *arenetra*, *cylloceria occidentalis*, 18 *lampronota*, 2 *meniscus*, 2 *phytodietus*, *xorides borealis*, *euxorides* n. g., *e. americanus*, 3 *xylonomus*, 2 *odontomerus*, in all 1 new genus and 70 new species of North American *pimplariae*, and gives a list of the 24 genera and 127 species; gives synoptical tables to discriminate the 21 species of *pimpla*, 3 *polysphincta*, 23 *glypta*, 4 *arenetra*, 22 *lampronota*, 6 *xylonomus*, 5 *odontomerus*. *B: P. M.* (3799)

Cresson, Ezra Townsend. Descriptions of Mexican *ichneumonidae*. (Proc. Acad. nat. sci. Philad., [v. 25]: 25 Mar.-8 Apr. 1873, p. 104-176; 13 Jan.-17 Feb. 1874, p. 374-413.) [Rec., 40.]

Describes 295 (210 new) species of 47 (*nonnus*, *toxophoroides* = 2 new) genera or subgenera of *ichneumonidae* from Mexico. *B: P. M.* (3800)

Cresson, Ezra Townsend. Descriptions of North American hymenoptera, in the collection of the Entomological society of Philadelphia. (Proc. Entom. soc. Philad., June 1864, v. 3, p. 131-196.)

Describes 5 (4 new) species of *foenus*, 2 new *aulacus*, 76 new *ichneumon* and 12 new *ischnus* all from North America, with a synoptic table of groups of *ichneumon* to facilitate determination; gives alphabetic index to the species here described. *B: P. M.* (3801)

Cresson, Ezra Townsend. Descriptions of North American hymenoptera, in the collection of the Entomological society of Philadelphia. (Proc. Entom. soc. Philad., Sep. 1864, v. 3, p. 257-321.)

Describes 30 species of *mesoleptus*, 16 *tryphon*, 5 *cteniscus*, 7 *exochus*, *trogus flavipennis*, *hoplismenus thoracicus*, 25 *cryptus*, 7 *phygadenon*, 5 *mesostenus*, and 3 *rhyssa*, all new North American species, with synoptic tables of groups of *mesoleptus*, *tryphon* and *cryptus*, to facilitate the determination of the species here described, and with alphabetic index to the species here described. *B: P. M.* (3802)

Cresson, Ezra Townsend. Descriptions of several new species of North American *apidae*. (Proc. Entom. soc. Philad., Apr.-May 1864, v. 3, p. 38-45.)

Describes *epeolus bifasciatus* ♂, *stelis montana* ♀, *xylocopa californica* ♀, *bombus consimilis* ♀, *b. centralis* ♀, *and apathus ashtoni* ♀, all new North American species, and re-describes *bombus borealis* ♀ ♂ ♂. *B: P. M.* (3803)

Cresson, Ezra Townsend. Descriptions of some new species of *mutilla*, from California. (Proc. Entom. soc. Philad., June 1865, v. 4, p. 385-390.)

Notice. (GERSTAECKER, A. Bericht... 1865-1866, hälfte 2, 1869, p. 25-26.)

Describes 7 new species of *mutilla*, from California and Lower California. *B: P. M.* (3804)

Cresson, Ezra Townsend. Descriptions of two new genera of North America *ichneumonidae*. (Proc. Entom. soc. Philad., Nov. 1864, v. 3, p. 397-402, 1 fig.)

Describes *grotea* n. g., *g. anguina* n. sp., *labena* n. g., *l. apicalis* n. sp., and re-describes T: Say's *cryptus grallator* as *labena grallator*; figures structural characters of *grotea*. *B: P. M.* (3805)

Cresson, Ezra Townsend. Descriptions of two new species of *arotes*. (Trans. Amer. entom. soc., Feb. 1869, v. 2, p. 260.)

Gives a synoptical table of the 5 known North American species of *arotes*, and describes *a. vicinus* and *a. venustus*, 2 new species. *B: P. M.* (3806)

Cresson, Ezra Townsend. Descriptions of two new species of *masaris*. (Proc. Entom. soc. Philad., Dec. 1864, v. 3, p. 672-678.)

Describes *masaris zonalis* ♀ ♂ and *m. marginalis* ♀, 2 new species, and re-describes *m. vespoides*, all from Colorado. *B: P. M.* (3807)

Cresson, Ezra Townsend. Descriptions of two new species of *masaris*. (Trans. Amer. entom. soc., Dec. 1871, v. 3, p. 348.)

Describes *masaris occidentalis* and *m. texanus*, 2 new species, from Texas. *B: P. M.* (3808)

Cresson, Ezra Townsend. Descriptions of two new species of *trigonalys*. (Proc. Entom. soc. Philad., Feb. 1867, v. 6, p. 351-352.)

Describes *trigonalys pulchellus* ♂ n. sp., from West Va., and *t.* (*lycogaster*) *costalis* ♂ n. sp., from Mass.; it *lycogaster* is a distinct genus, as author is "inclined to believe," *trigonalys gundlachii* belongs to it. *B: P. M.* (3809)

Cresson, Ezra Townsend. On the hymenoptera of Cuba. (Proc. Entom. soc. Philad., Jan. 1865, v. 4, p. 1-200, fig. 1-6.)

Notice. (GERSTAECKER, A. Bericht . . . 1865-1866, hälfte 2, 1869, p. 4, 17, 21, 22, 25, 26, 32-38, 40, 43.)

Enumerates 321 (257 new) species of hymenoptera found in Cuba, in general of all families except *proctotrupidae*, *formicidae* and the smaller *chalcididae*, with synonymical references, and describes the new species; describes *aulacodes*, n. g. of *evaniidae*, and *epirhyssa*, *ciphosoma*, *rhopalosoma* and *chaonia*, new genera of *ichneumonidae*. *B: P. M.* (3810)

Cresson, Ezra Townsend. Hymenoptera texana. (Trans. Amer. entom. soc., Nov. 1872, v. 4, p. 153-292.)

"List of all the species of hymenoptera known to me from Texas, excepting those belonging to the families *chrysididae*, *formicidae* and the smaller *chalcididae*; . . . of the 19 families studied in this paper, over 600 species are enumerated, nearly 300 of which appear to be new, and are herein described."—*Author*, op. cit., p. 153. Systematic index of species (p. 286-292). *B: P. M.* (3811)

Cresson, Ezra Townsend. List of the North American species of *bombus* and *apathus*. (Proc. Entom. soc. Philad., July 1863, v. 2, p. 83-116.)

Corrections, by author, with no title. (*op. cit.*, Oct. 1863, p. 164-166.)

Quotes description of generic characters of *bombus* from F: Smith's "Catalogue of British hymenoptera" . . . 1855, pt. 1, p. 207, and mentions other characters; describes generic characters of *apathus;* gives synoptical table and special description of 47 (15 new) North American species of *bombus*, and descriptions of 7 (1 new) N. A. species of *apathus;* discusses the sexual characters of *bombus;* gives alphabetic index (p. 116) to species here described. *B: P. M.* (3812)

Cresson, Ezra Townsend. List of the North American species of the genus *aleiodes* Wesmael. (Trans. Amer. entom. soc., Nov. 1869, v. 2, p. 377-382.)

Gives a synoptical table of the 22 North American species of *aleiodes*, and describes 20 new species. *B: P. M.* (3813)

Cresson, Ezra Townsend. A list of the North American species of the genus *anthophora*, with descriptions of new species. (Trans. Amer. entom. soc., Mar. 1869, v. 2, p. 289-293.)

Gives a synoptical table and synonymical list of the 14 North American species of *anthophora* known to the author, and describes 8 new species; 3 described species not recognized. *B: P. M.* (3814)

Cresson, Ezra Townsend. On the North American species of several genera of *apidae*. (Proc. Entom. soc. Philad., Feb.-Mar. 1864, v. 2, p. 373-411.)

Describes 10 (1 new) species of *anthidium*, 2 *chelostoma*, 2 (new) *heriades*, *andronicus* n. g., *a. cylindricus* n. sp., *alcidamea* n. g. and 2 n. spp., *monumetha* n. g. and 3 n. spp., 4 (1 new) *ceratina*, 9 (1 new) *epeolus*, 12 (3 new) *coelioxys*, and 4 (2 new) *stelis*, in all 3 new genera and 49 (16 new) species of *apidae* from North America; quotes the descriptions of the not new genera from F: Smith's "Catalogue of British hymenoptera"... 1855, pt 1; *coelioxys* parasitic on *megachile*. *B: P. M.* (3815)

Cresson, Ezra Townsend. On the North American species of the genus *nomada*. (Proc. Entom. Soc. Philad., Nov.-Dec. 1863, v. 2, p. 280-312.)

Quotes descriptions of generic characters of *nomada* from F: Smith's "Catalogue of British hymenoptera" . . . 1855, pt. 1, p. 116, and mentions other characters and variations of wing-neuration; describes 33 (17 new) North American species. *B: P. M.* (3816)

Cresson, Ezra Townsend. On the North American species of the genus *osmia*. (Proc. Entom. soc. Philad., Apr. 1864, v. 3, p. 17-38.)

Quotes description of the generic characters of *osmia* from F: Smith's "Catalogue of British hymenoptera" . . . 1855, pt. 1, p. 157, and describes the 33 (28 new) North American species, 31 of which are known to the author; refers to Smith's work, p. 158-162, for "a very interesting account of the economy of these bees." *B: P. M.* (3817)

Cresson, Ezra Townsend. Notes on the *pompilidae* of North America, with descriptions of new species. (Trans. Amer. entom. soc., June 1867, v. 1, p. 85-150, fig. 1-17.)

Notice, by F. Brauer. (GERSTAECKER, A. *and* BRAUER, F. Bericht . . . 1867-1868, 1871, p. 87.)

Enumerates 57 (15 new) species of *pompilus* subg. *pompilus*, 25 (13 new) *pompilus* subg. *priocnemis*, 28 (19 new) *pompilus* subg. *agenia*, 3 *ferreola*, 2 *notocyphus*, *parapompilus naomi*, 5 (2 new) *planiceps*, *aporus fasciatus*, 8 (2 new) *ceropales*, 3 (2 new) *mygnimia*, 20 (1 new) *pepsis*, from North America; describes the new species and re-describes nearly all the old species enumerated, or refers for their description to author's "On the hymenoptera of Cuba" (Proc. Entom. soc. Philad., Jan. 1865, v. 4) [Rec., 3810], p. 121-134, and author's "Catalogue of hymenoptera . . . from Colorado Territory" (Proc. Entom. soc. Philad., June 1865, v. 4) [Rec., 3792], p. 451-454; characterizes the genera and subgenera mentioned, and figures the neuration of the wings and other structural characters of some of the genera and species. *B: P. M.* (3818)

Cresson, Ezra Townsend. Notes on Cuban hymenoptera, with descriptions of new species. (Trans. Amer. entom. soc., Mar. 1869, v. 2, p. 293-298.)

Describes *sphex mandibularis* ♀, *larrada luteipennis* ♂, *agapostemon obscurata* ♀, *megacilissa? nigrescens* ♂, *m? subaurata* ♂, *megachile armaticeps* ♀, *coelioxys tegularis* ♀, *melissodes mimicus* ♂, and *centris armillatus* ♂, 9 new species; *odynerus dejectus* ♂, *o. cingulatus* ♂, *o. cubensis* ♂, *megachile curta* ♀ and var. *tibialis* ♀, *coelioxys producta* ♂, and *examalopsis similis* ♂, new sexes of not new species; with further descriptions of *monedula insularis* ♀ and var. ♀, *bembex argentifrons* ♀ ♂, and *b. armata* ♂, all from Cuba. *B. P. M.* (3819)

Cresson, Ezra Townsend. Notice of three new hymenopterous parasites. (Amer. entom., Jan. 1880, v. 3, n. s., v. 1, p. 24, 21 cm.)

Description of *anisopelma lycti* n. sp. parasitic on the larva of *lyctus striatus*, and of *a. utilis* and *a minima* both new species parasitic on the larva of *trogoxylon parallelipipedum*. *B: P. M.* (3820)

Cresson, Ezra Townsend. [On some species of *bombus*.] (Proc. Entom. soc. Philad., Oct. 1863, v. 2, p. 164-166.)

Corrections of author's "List of the North American species of *bombus* and *apathus*" (*op. cit.*, July 1863, p. 83-116) [Rec., 3812], and additional notes on *bombus pensylvanicus*, *b. virginicus* and *apathus elatus*; "*b. nidulans*" a variety of *a. elatus*, *b. impatiens* = *b. virginicus*; specimens of *b. separatus* n. sp. (here described) formerly confounded with *b. virginicus*; *b. virginicus* re-described; "*apis griseicollis*" ♀ = ? *b. virginicus* ♀; "*apis griseicollis*" ♂ = ? *xylocopa virginica* ♂. *B: P. M.* (3821)

Cresson, Ezra Townsend. Synopsis of the North American species belonging to the genera *leucospis*, *smicra* and *chalcis*. (Trans. Amer. entom. soc., Feb. 1872, v. 4, p. 29-60.)

Describes 10 (8 new) species and 1 new variety of *leucospis*, 52 (33 new) species and 1 new variety of *smicra*, and 4 (3 new) species of *chalcis*, from North America; quotes descriptions of 3 *leucospis* and 20 *smicra* unidentified, and refers to descriptions of 2 (unidentified) *smicra* and 6 (3 unidentified) *chalcis* not here described; gives synoptical tables to discriminate the identified species of each of these genera. *B: P. M.* (3822)

Csokor, Johann. Ueber haarsackmilben und eine neue varietät derselben bei schweinen. *demodex phylloides*. (Verhandl. k.-k. zool.-bot. gesells. in Wien, 1879, v. 29, p. 419-450, pl. 8.)

History, literature, classification and description of five varieties of *demodex;* anatomy, natural history and occurrence of *d. phylloides*, which lives in the skin of the hog. *G: D.* (3823)

Dahl, Friedrich. Ueber die hörhaare bei den arachnoiden. (Zool. anzeiger, 21 May 1883, jahrg. 6, p. 267-270, 2 fig.) [not seen.]

Notice, by P. Mayer. (Zool. jahresb. für 1883, 1884, abth. 2, p. 58-59.)

Demonstration of auditory hairs on the legs, palpi and claws of arachnida; position and action of these hairs.—Mayer, *l. c.* *B: P. M.* (3824)

Dahl, Friedrich. Beiträge zur biologie der spinnen. (Zool. anzeiger, 3 Nov. 1884, jahrg. 7, p. 591-595.)

Partial Engl. tr. entitled "Contributions to the biology of spiders." (Ann. and mag. nat. hist., Jan. 1885, s. 5, v. 15, p. 70-72.)

Notes upon the intelligence, instinct, acuteness of sight and of hearing, and reparation of nests of spiders; secondary sexual characters of spiders and their dependence upon sexual selection. *G: D.* (3825)

Dahl, Friedrich. Contributions to the biology of spiders. (Ann. and mag. nat. hist., Jan. 1885, s. 5, v. 15, p. 70-72.)

Partial tr. of the author's "Beiträge zur biologie der spinnen" (Zool. anzeiger, 3 Nov. 1884, jahrg. 7, p. 591-595) [Rec., 3825]. *G: D.* (3826)

De Garmo, James M. Some evidence of intelligence in butterflies. (Trans. Vassar brothers' institute, 1883-1884, 1884, v. 2, p. 129-135.)

Considers how far the actions of certain butterflies are governed by intelligence. *G: D.* (3827)

Dewitz, H. Die befestigung durch einen klebenden schleim beim springen gegen senkrechte flächen. (Zool. anzeiger, 21 May 1883, jahrg. 6, p. 273-274.)

Notice, by P. Mayer. (Zool. jahresb. für 1883, 1884, abth. 2, p. 1, 7.)

Dewitz endeavors, upon *a priori* grounds, to show that a viscid secretion is essential to the instantaneous fixing of springing insects, especially such as live on trees and bushes, and springing spiders. *E: L. M.* (3828)

Dorfmeister, Georg. Ueber den einfluss der temperatur bei der erzeugung der schmetterlings-varietäten. (Mittheil. Naturwissensch. ver. f. Steiermark, jahrg. 1879 [Graz, 1880]; Abhandl., p. 3-8, pl.)

Separate. Graz, *author*, 1880. 8 p., 1 col. pl., 23 × 15, t 17.5 × 10.1.

Colored figure of a *vanessa atalanta* of normal coloration and one in which the coloration was varied by exposing its pupa to a low temperature; results of other experiments in producing varieties with this and other butterflies by varying the temperature to which the pupa was exposed. *G: D.* (3829)

Druce, Herbert. Descriptions of new species of *aegeriidae* and *sphingidae*. (Entom. mo. mag., June 1882, v. 19, p. 15-18.)

Describes 10 new species, one of which, *choerocampa godmani*, inhabits Panama. *B: P. M.* (3830)

Du Bose, J. W. Influence of winds on *aletia*. (Amer. entom., Apr. 1880, v. 3, n. s., v. 1, p. 105-106, 35 cm.)

Record of author's observation that *aletia xylina* only injures cotton plants after the prevalence of east and south-east winds; the character of foliage and fruitage is favorable to the insects and unfavorable to the crop in seasons when those winds prevail. *B: P. M.* (3831)

Dury, C: Notes on food of raptorial birds. (Journ. Cincinnati soc. nat. hist., April 1885, v. 8, p. 62-67.)

Among other animals found in crops of birds, insects were found in *buteo linearis*, *bubo virginianus* and *scops asio*. *G. D.* (3832)

Dwight, W: Buck. Appearance of the bean-weevil, *bruchus fabae*, (*varicornis*), at Poughkeepsie. (Trans. Vassar brothers' inst., 1881-1883, v. 1, p. 80-87.)

Notes on the habits of *bruchus fabae*. *G: D.* (3833)

Eaton, Alfred Edwin. Dragon-flies and telegraph wires. (Entom. mo. mag., Nov. 1879, v. 16, p. 135.)

Reprint. (Amer. entom., Jan. 1880, v. 3, n. s., v. 1, p. 20, 5 cm.)

Observation upon a habit of small species of *libellula* of alighting on telegraph wires and eating their prey there. ["*Libellulidae*" in the reprint (corrected) substituted for "*libellulae*" in the original.] *B: P. M.* (3834)

Edes, R: A. Cotton culture and the insects affecting the plant at Bahia, Brazil. (Amer. entom., May 1880, v. 3, n. s., v. 1, p. 128-129, 29 cm.)

Letter, with notes [by C: V. Riley]; cotton not much cultivated at Bahia, Brazil; its insect enemies and their seasons; direction of the winds in fall and winter. Description of egg, larva and pupa of "the cotton worm of Bahia" (*anomis* sp.); suggestion of the identity of this insect with *aletia argillacea* of Hübner; list of insects found in bolls of cotton sent from Bahia. *B: P. M.* (3835)

Edible insects. (Prairie farmer, 5 Nov. 1864, [v. 30], n. s., v. 14, p. 298, 31 cm.)

Mentions use of locusts, ants, white-ants, various larvae and pupae, a *psylla*, spiders, worms, snails and other small animals, as food for humans. *B: P. M.* (3836)

Edwards, W: H: On certain North American species of *satyrus*. (Proc. Entom. soc. Philad., July 1866, v. 6, p. 195-200.)

Discussion of the genetic relations and specific characters of *satyrus pegala* and *s. alope*, which form one group of the genus, and *s. nephele*, *s. ariane* and *s. boopis*, which form another group; detailed comparisons of *s. alope* and *s. nephele* in characters and geographical distribution; *s. nephele* perhaps the ancestral form; limits to range of variation of butterflies; criteria of species. *B: P. M.* (3837)

Edwards, W: H: Description of a new hesperian. (Trans. Amer. entom. soc., July 1868, v. 2, p. 122.)

Describes *hesperia waco* n. sp., from Texas. *B: P. M.* (3838)

Edwards, W: H: Description of a new species of *limenitis*. (Proc. Entom. soc. Philad., Sep. 1865, v. 5, p. 148.)

Describes *limenitis proserpina* n. sp., from N. Y. *B: P. M.* (3839)

Edwards, W: H: Description of certain species of diurnal lepidoptera found within the limits of the United States and British America. No. 1. (Proc. Entom. soc. Philad., Mar. 1863, v. 2, p. 14-22, pl. 1, 5, 11.)

Describes and figures *colias alexandra* and 10 species of *hesperia*, and describes *thecla clothilde* and *hesperia omaha*, all new species, from United States or British America. *B: P. M.* (3840)

Edwards, W: H: Description of certain species of diurnal lepidoptera found within the limits of the United States and British American. No. 2. (Proc. Entom. soc. Philad., July 1863, v. 2, p. 78-82.)

Describes *parnassius sayii* ♀, *colias christina*, *c. helena*, *lycaena amica* ♂ and *melitaea texana* ♂, all new species, and describes *anthocaris ausonoides* and *chionobas chryxus*, previously mentioned or figured, but not described; all from United States or British America. *B: P. M.* (3841)

Edwards, W: H: Description of certain species of diurnal lepidoptera found within the limits of the United States and British America. No. 3. (Proc. Entom. soc. Philad., Mar. 1864, v. 2, p. 501-507.)

Describes *pieris vernalis*, *eresia cincta*, *argynnis hesperis*, *melitaea pallida*, *m. phaon*, *lycaena echo*, *l. lycea* and *hesperia nemoris*, new species, and *pieris nasturtii* and *argynnis epithore*, 2 new species named by Boisduval *in litt.*, all from United States; and remarks upon the distribution of some related species. *B: P M.* (3842)

Edwards, W: H: Description of certain species of diurnal lepidoptera found within the limits of the United States and British America. No. 4. (Proc. Entom. soc. Philad., Jan. 1865, v. 4, p. 201-204, pl. 1, fig. 2-6.)

Describes *melitaea picta* ♂, *satyrus ridingsii* ♀, *hesperia napa* ♂ ♀ (fig.), *h. maculata* ♀ (fig.), *h. viator* ♂ (fig.) ♀, *h. ricara* ♂ (fig.), *lycaena rustica* ♂ ♀, 7 new U. S. species. *B: P. M.* (3843)

Edwards, W: H: Description of certain species of diurnal lepidoptera found within the limits of the United States and British America. No. 5. (Proc. Entom. soc. Philad., July-Oct. 1866, v. 6, p. 200-208.)

Describes *papilio bairdii* ♂, *colias behrii*, *lycaena violacea*, *l. mertila* ♀, *syrichtus alba* ♂, *hesperia ottoe* ♂, *h. mingo* ♂, and *h. yreka* ♂, 8 new United States species; quotes the original desciption of *lycaena lucia* in full, re-describes *l. pseudardiolus*, and compares these two species, *l. violacea* and *l. neglecta* as to their characters, seasons, and geographical distribution; list of 13 species of butterflies received from Arizona. *B: P. M.* (3844)

Edwards, W: H: Description of the female of *argynnis diana*. (Proc. Entom. soc. Philad., Nov. 1864, v. 3, p. 431-434.)

Describes *argynnis diana* ♀ for the first time; habits and seasons of ♂ and ♀; "the males of most, if not all, species of butterflies appear some days earlier than the females, and disappear as much sooner"; notes on the relative abundance of more than 30 species of diurnal lepidoptera and of a few *sphingidae* in West Virginia; seasons of the species of *lycaena* observed; occurrence of dimorphic forms of *papilio turnus* and *limenitis ursula*. *B: P. M.* (3845)

Edwards, W: H: Descriptions of certain species of *catocala*, found within the United States. (Proc. Entom. soc. Philad., Mar. 1864, v. 2, p. 508-512.)

Describes 11 new species of *catocala*, from United States. *B: P. M.* (3846)

Edwards, W: H: Descriptions of certain species of diurnal lepidoptera found in the United States. (Trans. Amer. entom. soc., Apr. 1869, v. 2, p. 311-312.)

Describes *hesperia wakulla* ♂ and *h. eufala* from Florida, and *h. melane* from California; occurrence of *timetes cleucha* in Florida. *B: P M.* (3847)

Edwards, W: H: Descriptions of certain species of diurnal lepidoptera found within the limits of the United States and British America. No. 2. (Proc. Acad. nat. sci. Philad., Feb. 1862, [v. 14], p. 54-58.)

Describes *argynnis atlantis*, *thecla acadica* ♂, *th. laeta*, *lycaena neglecta*, *pamphila verna*, *p. rurea*, and *hesperia vialis*, all new species, and describes *chionobas taygete* ♀; all from North America; remarks upon the comparative characters and geographical distribution of species closely allied to the *argynnis* and *lycaena*. *B: P. M.* (3848)

Edwards, W: H. Descriptions of certain species of diurnal lepidoptera, found within the limits of the United States and of British America. No. 3. (Proc. Acad. nat. sci. Philad., Apr. 1862, [v. 14], p. 221-226.)

Describes *argynnis nokomis* ♂, *grapta faunus*, *thecla californica*, *th. viridis*, *th. affinis*, *lycaena behrii*, *l. pembina* and *l. shasta*, all new species; describes *parnassius smintheus* and *limenitis eulalia*, previously figured but not described; and describes *lycaena scudderii* ♀: all from North America. *B: P. M.* (3849)

Edwards, W: H: Descriptions of certain species of diurnal lepidoptera found within the United States, figured in Doubleday's Genera but undescribed. (Proc. Entom. Soc. Philad., July 1862, v. 1, p. 221-224.)

Describes *argynnis astarte*, *melitaea chalcedon*, and *m. anicia*, all three from Pacific coast or Rocky Mountains of United States, and *timetes coresia*, from Texas; *m. anicia* also from Kansas. *B: P. M.* (3850)

Edwards, W: H: Descriptions of new North American diurnal lepidoptera. (Trans. Amer. entom. soc., Nov. 1870, v. 3, p. 189-196.)

Describes *pieris calyce* ♂, *argynnis bischoffii*, *melitaea sterope*, *m. thekla* ♂, *eresia punctata* ♂, *chionobas stretchii*, *satyrus gabbii*, *thecla dryope*, *lycaena mintha*, *l. fulla*, *lemonias palmerii*, *syrichtus petreius* ♂, *cyclopides skada* ♂, and *hesperia minima* ♂, 14 new species from North America. *B: P. M.* (3851)

Edwards, W: H: Descriptions of new species of diurnal lepidoptera found within the United States. (Trans. Amer. entom. soc., Sep. 1869, v. 2, p. 369-376.)

Describes *anthocaris reakirtii*, *pieris hulda*, *argynnis behrensii*, *melitaea vesta*, *m. arachne*, *grapta oreas*, *g. satyrus*, *coenonympha kodiak*, *c. brenda*, *thecla chalcis* and *lycaena orcus*, all new species from North America, with descriptive comparative notes on larvae and imagos of *grapta*. *B: P. M.* (3852)

Edwards, W: H: Descriptions of new species of diurnal lepidoptera found within the United States. (Trans. Amer. entom. soc., Jan. 1870, v. 3, p. 10-22.)

Describes *parnassius behrii* ♂, *colias edwardsii* Behr, *c. emilia*, *c. ariadne*, *pieris virginiensis*, *argynnis nevadensis*, *grapta silenus* ♂, *g. zephyrus* ♂, *g. marsyas*, *g. dryas*, *thecla behrii*, *th. tetra* Behr, *th. dryope*, *lycaena kodiak*, *chrysophanus cupreus*, *ch. hermes*, *ch. virginiensis* and *hesperia hayhurstii*, 18 new species from North America. *B: P. M.* (3853)

Edwards, W: H: Descriptions of new species of diurnal lepidoptera found within the United States. (Trans. Amer. entom. soc., Jan. 1871, v. 3, p. 205-216.)

Describes *anthoc[h]aris hyantis*, *phyciodes orseis*, *ph. canace* ♂, *thecla cygnus* ♀, *th. castalis*, *lycaena helios*, *l. viaca* ♂, *l. ardea* ♂, *l. glaucon*, *l. gyas* ♂, *l. epixanthe*, *chrysophanus ianthe*, *charis nemesis* ♂, *euptychia rubricata*, *coenonympha ampelos*, *syrichtus oceanus*, *s. sterroptes skada* ♂, *heteropterus arene* ♂, *h. proctor*, *hesperia tamenund* and *h. ophis*, 21 new species from North America; states in note, on authority of A. G. Butler, that *thecla castalis* = *papilio* [*thecla*] *damon*; note also on *euptychia rubricata*. *B: P. M.* (3854)

Edwards, W: H: Descriptions of new species of North American butterflies. (Trans. Amer. entom. soc., Feb.-Apr. 1871, v. 3, p. 266-267.)

Describes *anthoc[h]aris olympia*, *colias meadii*, *argynnis helena*, *phyciodes camillus* ♂, *ph. emissa*, *chrysophanus sirius*, *thecla minus* ♂, *th. autolycus* ♂, *th. alcestis* ♀, *lycaena daunia* ♂, *l. alce* ♂, *erebia rhodia*, *e. callias*, *thymeticus hylax* ♂, *pamphila draco*, *p. licinus* ♂, *p. attalus* ♀, *hesperia eos* ♂, *h. dacotah* ♂ and *h. horus* ♀, 20 new species from United States; describes also *lycaena lycea* ♀. *B: P. M.* (3855)

Edwards, W: H: Larva of *apatura alicia*. (Amer. entom., Aug. 1880, v. 3, n. s., v. 1, p. 206, 2 cm.)

Larva of *apatura alicia* obtained from Florida, its coloration and distinctness from the larva of *a. celtis*. *B: P. M.* (3856)

Edwards, W: H: List of species of butterflies collected by Campbell Carrington and William B. Logan, of the expedition, in 1871. (HAYDEN, F. V. Preliminary rept. U. S. geol. surv. Montana . . . 1872, p. 466-467.)

List of 31 species of butterflies collected in Montana and adjacent territories; describes *erebia haydenii* n. sp. *B: P. M.* (3857)

Edwards, W: H: Notes on a remarkable variety of *papilio turnus*, and descriptions of two species of diurnal lepidoptera. (Trans. Amer. entom. soc., Sep. 1868, v. 2, p. 207-210.)

Records the capture of a *papilio turnus* ♀, one half of black (*p. glaucus*) and one half of yellow (*p. turnus*) coloration; describes *melitaea marcia* and *thecla ontario* ♂, 2 new species from North America; gives synonymical and descriptive comparative notes on several species of *melitaea*. *B: P. M.* (3858)

Edwards, W: H: Notes on graptas *c-aureum* and *interrogationis*. Fab. (Trans. Amer. entom. soc., Jan. 1870, v. 3, p. 1-9.)

Crit. rev., by J. A. Lintner, entitled "On Graptae *interrogationis* and *fabricii* of Edwards." (*op. cit.*, Dec. 1870, p. 197-204.)

Synonymical and comparative descriptive notes on the 3 species of *grapta* to which have been applied the trivial names *c-aureum*, *angelica*, *interrogationis* and *umbrosa*, and re-description of one of these species as *g. capta fabricii* n. sp.; describes *g. dryas* n. sp., and eggs, larvae and pupae of *g. interrogationis* and *g. fabricii*; compares imago of *g. comma* with the other species. *B: P. M.* (3859)

Edwards, W: H: Notes upon *grapta comma*, Harris, and *grapta faunus*, Edwards (*c-album*, of some authors). (Proc. Entom. soc. Philad., Mar. 1862, v. 1, p. 182-184.)

Distinguishes *grapta comma* from *g. faunus*, and both from *g. c-album*; describes larvae and pupa of *g. comma*; food-plants, seasons and geographical distribution of *g. comma* and *g. faunus*; distinguishes three varieties of *g. interrogationis*. *B: P. M.* (3860)

Edwards, W: H: Notes upon *papilio asterias* and *saturnia promethea* hermaphrodites. (Proc. Entom. soc. Philad., June 1865, v. 4, p. 390.)

Mentions a specimen of *papilio asterias* with right wings male and left wings female, and one of *saturnia promethea* with male and female characteristics intermixed. *B: P. M.* (3861)

Entomological club of the American association for the advancement of science—*President, 1879* (Joseph Albert Lintner). Annual address. (Can. entom., Sep. 1879, v. 11, p. 163-175.)

Review of the progress in entomology in North America during the past year, with notices and reviews of some of the entomological publications of the year; statistics of the number of entomologists in North America. *B: P. M.* (3862)

French, G: Hazen. A new species of *arctia*. (Can. entom., Mar. 1879, v. 11, p. 45-46.)

Describes *arctia rectilinea* n. sp. *G: D.* (3863)

French, G: Hazen. Some new species of *noctuidae*. (Can. entom., Apr. 1879, v. 11, p. 76-78.)

Describes *dicopis vitis*, *orthosia signata*, and *heliothis illinoiensis*, 3 n. sp. of *noctuidae*, the last from Ill. *G: D.* (3864)

Goding, F. W. Insects injurious to vegetation in Iowa. (Rept. Iowa state agric. soc. for 1882, 1883. p. 322-329.)

Reprint, by author, entitled "A report on insects injurious to vegetation in Iowa, to the secretary of the state agricultural society, for the year 1882. Ancona, Ill., *Advocate publ. co*., 1883. 11 p., 23 × 16, t 16 × 11.

Treats in a general and popular manner, typographically very inaccurrate, of *anisoptery.x* [corr.] *vernata*, *clisiocampa americana*, *selandria rubi*, *phyllophaga fusca*, *leucania unipuncta*, *blissus leucopterus*, *doryphora decemlineata*, *pionea rimosalis* and *pieris rapae*, and how to destroy them. *G: D.* (3865)

Goding, F. W. A report on the insects injurious to vegetation in Iowa, to the secretary of the State agricultural society, for the year 1882. (Reprint from the Transactions.) Ancona, Ill., *Advocate publ. co.*, 1883. 11 p., 23 × 15.5, t 16 × 11.

Reprint of author's "Insects injurious to vegetation in Iowa" (Rept. Iowa state agric. soc. for 1882, 1883, p. 322-329) [Rec., 2865], with many typographical blunders. *G: D.* (3866)

Grote, A: Radcliffe. A new *catocala* from Florida. (Can. entom., Jan. 1879, v. 11, p. 15.)

Describes *catocala sinuosa* n. sp., from Florida. *G: D.* (3867)

Grote, A: Radcliffe. On a new species of *polia*. (Can. entom., May 1879, v. 11, p. 94-96.)

Notes on the generic characters of *polia;* description of *p. illepida* n. sp., from Nev. and Col. *G: D.* (3868)

Guillebeau, A. *and* **Luchsinger**, B. Fortgesetzte studien zu einer allgemeinen physiologie der irritabeln substanzen. Ein beitrag zur kenntnis des centralmarkes der annulata Cuvieri. (Arch. gesammte phys. . . . Pflüger, 27 June 1882, v. 28, p. 1-60.)

Notice by P. Mayer. (Zool. jahresb. für 1883, 1884, abth. 2, p. 1, 4.)

Gives the result of experiments with various poisons (kalium, strychnin, morphium, curare, coniin) upon several insects, insect larvae, and other invertebrates, treating of insects especially on p. 12, 25, 26, 45. A comparison of their results with the histological conclusions of their predecessors leads to the conviction that the latter seriously need revision. They controvert Leydig's claim that a part of the fibres of the commissures enter the ganglia to emerge at once in the lateral nerves [*i. e.*, without the interpolation of ganglionic cells.] *E: L. M.* (3869)

Horn, G: H: Memoir of John L. LeConte, M. D. (Proc. Amer. philos. soc., 16 Nov. 1883 [1884], v. 21, p. 294-299.)

Account of the life and life-work of Dr. John Lawrence LeConte. *G: D.* (3870)

Kingsley, J: Sterling. Is the group arthropoda a valid one? (Amer. nat., Oct. [Sep.] 1883, v. 17, p. 1034-1037.)

Germ. tr., with additions, entitled "Bilden die arthropoden eine natürliche gruppe?" (Kosmos, Dec. 1883, jahrg. 7, v. 13, p. 688-691, 136 cm.)

Notice, by P. Mayer. (Zool. jahresb. für 1883, 1884, abth. 2, p. 1, 4.)

Both upon anatomical and developmental grounds Kingsley urges the separation of tracheata from crustacea. The common feature of the possession of compound eyes, not otherwise easily explicable, is the only feature not readily made consistent with the view that the two groups are not nearly related. [The (anonymous) article in Kosmos reproduces Kingsley's "with some not unessential additions," to which it is added further that Balfour had previously arrived at similar conclusions from embryological data.] *E: L. M.* (3871)

Kraepelin, Karl. Ueber die geruchsorgane der gliederthiere. Eine historisch-kritische studie. (Osterprogramm der Realschule des johanneums, 1883.) Hamburg, 1883. 48 p., 3 pl., 4°.

Notice, by P. Mayer. (Zool. jahresb. für 1883, 1884, abth. 2, p. 1, 6.)

An historical sketch of the olfactory organs of arthropods is followed by a bibliographic list (59 numbers) grouped according to the languages in which the articles were written. Discusses critically the previous results of others and compares them with his own observations on several crustacea, and on *melolontha*, *strangalia*, *chrysopa*, *stenobothrus*, *blatta*, *vanessa*, *tabanus*, *musca*, *vespa*, *formica*, *sirex* and *bombus*.
E: L. M. (3872)

Kriechbaumer, Josef. Schattenseiten der entomologischen zeitschriften-litteratur und vorschläge zur beseitigung derselben. Eine zuschrift an die entom. section der Naturforscher-versammlung in Danzig. (Entom. nachrichten, 1 Sept. 1880, jahrg. 6, p. 181-189.)

Against multiplication of entomological periodicals, especially those published in little-used languages; suggestions how to conduct entomological periodicals; special criticism of the first numero of the *Entomologisk tidskrift* in Stockholm, Sweden. *G: D.* (3873)

Künckel d'Herculais, Jules. The muscular power of insects. (Sci. amer., 10 Dec. 1881, n.s., v. 45, p. 370. fig. 1-2, 87 cm.)

Tr. from *La nature*. Description and illustration of manner of testing the muscular power of insects; muscular attachments of wings; proportions between weight of body, surface of wing, and power and velocity of flight; positions of elytra in flight; results of mutilating wings. *B: P. M.* (3874)

Kunst-Honig. (Deutscher Bienenfreund, 15 May 1881, jahrg. 17, p. 157.)

Brief notice of artificial honey in the comb.
G: D. (3875)

Lachnosterna fusca. (Can. entom., Sept. 1881, v. 13, p. 195.)

Destructiveness of larva. *A. K. D.* (3876)

Lankester, E. Ray *and* **Bourne**, A. G. The minute structure of the lateral and the central eyes of *scorpio* and of *limulus*. (Quart journ. micr. sci., Jan. 1883, v. 23, p. 177-212, pl. 10-12.)

Notice, by P. Mayer. (Zool. jahresb. für 1883, 1884, abth. 2, p. 1, 4-5.)

An important paper on the histological structure of the eyes in arthropods, in which an extensive new terminology is employed. The agreement in structure between the eyes of *limulus* and the scorpions leads to the conclusion that *limulus* is an arachnid.
E: L. M. (3877)

Landwehr, F. Der zug von *libellula 4-maculata*. (Entom. nachrichten, 1 Oct. 1881, jahrg. 7, p. 280-281.)

Great flight of *l. quadrimaculata* at Bielefeld, Prussia, 30 May 1881. *G: D.* (3878)

La Salle, C. Bee notes. (Pacific rural press, 2 July 1881, v. 22, p. 4, col. 3, 9 cm.)

[From Lompoc (Cal.) *Record*.] Food-plants of honey bees in California. *B: P. M.* (3879)

Lowne, B: Thompson. On the structure and functions of the eyes of arthropoda. Abstract. (Proc. Roy. soc. Lond., 5 Apr. 1883, v. 35, p. 140-145.)

The author claims 4 forms of eyes: simple ocelli, compound ocellus (larval insects), aggregate (*isopoda*) and compound eye. A brief description of each is given. Discarding all previous theories of vision by compound eyes, it is held that "a continuous picture is formed by *a mosaic of erect, magnified central portions of the several subcorneal images*, falls upon the retina." There follows a summary of the following chapters:

I. The structure and functions of the "dioptron."
II. " " " " " " "neuron."
III. " development of the compound eye.
IV. " morphology of the eyes of arthropods.
E: L. M. (3880)

MacLeod, Jules. Recherches sur la structure et la signification de l'appareil respiratoire des arachnides. (Arch. de biol., 1884, v. 5, p. 1-34, pl. 1-2.)

Separate. [Gand, 1884.] t.-p. cover, 34 p., 2 pl., 25 × 16, t 16.5 × 9.5.

Comparative anatomy and histology of the lungs and tracheae of arachnoidea and of the branchiae of *limulus* with a view to showing the relationship between the lungs of arachnoidea and the branchiae of *limulus*, and also the relationship between the lungs and tracheae of the araneida. *G: D.* (3881)

[**Walsh**, B: Dann *and* **Riley**, C: Valentine.] The boll-worm or corn-worm. 2d article *Heliothis armigera*, Hübner. (Amer. entom., Nov. 1869, v. 2, p. 42-44, 103 cm., fig. 29.)

Food-plants, seasons and ravages of and means against *heliothis armigera;* food-plants of *gortyna nitela;* list of larvae which bore in young stem of corn; difference between the several generations of one species of insect; rough figure of larvae, pupa, cocoon and imago of *h. armigera* and of corn-cob injured by the larva. *B: P. M.* (3882)

Worthington, C: Ellis. Collecting about Chicago in 1878. (Can. entom., Apr. 1879, v. 11, p. 68-72.)

Gives a list of 229 species of *noctuidae*, mostly taken at sugar, from the vicinity of Chicago, Ill. *G: D.* (3883)

Zeiller, R. Sur des traces d'insectes simulant des empreintes végétales. (Bull. soc. géol. France, Nov. 1884, 3e sér., v. 12, p. 676-680, pl. 30.)

Engl. tr., by Joseph H. James, entitled "On the tracks of insects resembling the impressions of plants." (Journ. Cincinnati soc. nat. hist., Apr. 1885, v. 8, p. 49-52.)

Figures the ridges raised in half-dried mud by *gryllotalpa*, and compares them with conifers of the genus *brachyphyllum* from French oolite, without proposing to question the vegetal nature of the fossils.
S: H. S. (3884)

ENTOMOLOGICAL ITEMS.

MR. W. M. MASKELL has lately described a curious species of *coccidae* from New Zealand under the name of *Rhizococcus fossor*. The female of this species, which lives on *Cartolum cunninghamii*, does not cover herself with a scale, but sinks herself bodily in a circular pit in the substance of the leaf and there lays her eggs.

ENTOMOLOGICAL SOCIETY OF LONDON.—This society, on the fiftieth year of its existence, 1883, decided to take measures to obtain a royal charter. This charter has now been granted the society under date of 20 July 1885, and ensures the society a legal existence and increased privileges and responsibilities.

INTRODUCTION OF HUMBLE-BEES INTO NEW ZEALAND. The attempts to introduce humble-bees (*Bombus*) into New Zealand, in order that they may fertilize the red clover, have been hitherto unsuccessful, but this year a few have been landed alive in that country, having been brought in their dormant winter condition from England, and set free upon awakening.

ELECTION OF HONORARY MEMBERS. At the session of the Entomological society of France, 11 March 1885, E. de Sélys Longchamps, of Liége, Belgium, S. A. de Marseul, of Paris, and Dr. G. H. Horn, of Philadelphia, Pa., were elected honorary members of that society, and at the session of 8 April 1885, Dr. Auguste Puton, of Remiremont, France, was also chosen an honorary member.

TYPES OF LEPIDOPTERA TRANSFERRED TO CAMBRIDGE. Dr. Hagen informs us that the collection of lepidoptera heretofore at the Peabody museum, Salem, Mass., is now in his charge at Cambridge. The move is a good, and very necessary one. The collection contains many of Dr. Packard's and some of Mr. Morrison's types, and was slowly going to dust and *Anthrenus* when we last saw it.—*Entom. americana*, June 1885, v. 1, p. 54.

GROTE AS A COMPOSER.—Mr. A. R. Grote, the American lepidopterist, now residing in Bremen, has not only published numerous papers on moths, but several American magazines have printed verses by him. Shortly before leaving America he published a philosophico-religious essay, and he now takes the field as a composer of music, Fischer, of Bremen and New York, publishing his op. 2, which consists of Vier männerquartette, dedicated to Herr C. O. Ruyter.

CHEVROLAT'S COLLECTION OF COLEOPTERA.—The large collection of coleoptera belonging to the late Auguste Chevrolat is offered for sale, divided into families, by H. Deyrolle et Cie, of Paris. The prices vary from 10 francs for the box of *thorictidae*, of which there are 11 species represented by 30 specimens, up to 9000 francs for the *curculionidae* which are represented by 9000 species and 29000 specimens. The collection of *curculionidae* is said to be the largest excepting that of the museum at Brussels.

SPECIMENS FADED BY EXPOSURE TO LIGHT.—At a recent meeting (July 2) of the London entomological society, Mr. C. O. Waterhouse exhibited various species of phytophagous beetles to show the extraordinary effect that exposure to light had produced on their colors. Fiery red had turned to bright green, pale yellow to brown, blue to black, and green to purple. The specimens exhibited had been in the public galleries of the Bristol museum for twenty-five years.—*Amer. naturalist*, Jan. 1885, v. 19, p. 80.

TRIMEROUS SILPHIDAE.—Mr. D. Sharp describes a new species of the genus *Scotocryptus* (*silphidae*) in the Comptes-rendus de la Société entomologique de Belgique for 7 Feb. 1885. This species, *S. obscurus*, like *S. meliponae*, the one on which Girard founded the genus in 1874, is from Bahia, South America. The species of *Scotocryptus* are blind, but are still more interesting structurally from the fact that they have all the tarsi three-jointed, a character not common among coleoptera and otherwise un-

known among *silphidae*. *S. meliponae* inhabits nests of *Melipona scutellaris;* the habits of *S. obscurus* are unknown.

FOOD-HABITS AND VESICATING POWER OF CANTHARIS. H. Beauregard, who has lately been completing his studies into the life-history of *Cantharis vesicatoria*, has succeeded in finding its pseudochrysalids in the sand about the cells of species of *Colletes*, upon the honey of which the larvae had subsisted. In the *Comptes rendus* for 8 June 1885, he also states that he has proved by direct experiment the inaccuracy of Neutwich's assertion that the vesicating power of *Cantharis* is only developed after copulation. As previously shown by Beauregard the cantharidin is chiefly located in the generative organs of these beetles, but experiments with the generative organs of specimens just emerged, and that certainly had not copulated, showed the presence in them of strong vesicating power.

INFUSORIAL PARASITES OF WHITE ANTS. In a paper read before the Royal society of Tasmania, 17 Nov. 1884, Mr. W. Saville Kent described a new species of infusorian belonging to the genus *Trichonympha* of Leidy, and which Mr. Kent names *T. leidyi*. This species differs but little from the species (*T. agilis*) on which Leidy based the genus, and is found swarming in the intestinal canal of a Tasmanian species of *termitidae*, which has not yet been determined. Leidy recommends that, for the observation of these infusoria, the contents of the intestine of the white ant be emptied into a little white of an egg; Kent recommends milk for the same purpose. Kent further says "Of the two remaining infusoria found by me in the Tasmanian white ant the one is apparently referable to Dr. Leidy's genus *Pyrsonympha*, while the other belongs to Stein's multiflagellate genus *Lophomonas*, so far recorded as a parasite only of the orthopterous insects *Blatta* and *Gryllotalpa*."

INSECTS MISTAKING LEAVES FOR FLOWERS. At the meeting of the Entomological society of London, 1 April 1885, according to the *Entomologist's monthly magazine*, for May 1885, v. 21, p. 278;—"Mr. R. M. Christy (present as a visitor) exhibited a drawing of the larva of the local form of *Platysamia columbia*, known as *nokomis:* he had found the larva in Canada feeding on *Elaeagnus argentea*, the peculiarly silvery appearance of which was strikingly in accord with the color of the larva, which latter was probably protected thereby. He also showed faded leaves of *Betula glandulosa*, and said he had observed *Papilio asterias* settle on similar patches of leaves, apparently mistaking them for flowers on account of the bright coloring. Mr. [J: J.] Weir said he had observed white butterflies settle on patches of variegated leaves in his own garden, and he alluded to the well-known case of bees coming to artificial flowers on a lady's bonnet."

PRESERVATION OF INSECTS.—Apropos of the different notes upon the preservation of insects, that have been addressed to us, Dr. Jacobs states that he has recommended, in the *Bulletin de la Société entomologique de Belgique* (1879), the use of a solution of naphthalin in benzin. The insect is immersed in it, and, after drying, the crystals of naphthalin which are formed on the surface of the body are removed with a small brush. The solution penetrates the interior of the insect, where the presence of the naphthalin can be recognized. This process can be used for coleoptera, but not for the diptera, bees, and other hairy insects, for the brush removes the hairs and spoils the insect.

Mr. Charles Zuber employs liquid ammonia to remove the salts of copper which form upon the pins; this process does not injure the insects. It is of course understood that the insects should not be replaced in their boxes until completely dried.—*Feuille des jeunes natur.*, April 1885, ann. 15, p. 81.

ENTOMOLOGY DURING THE YEAR 1883.—An examination of the index of new genera which were established in the year 1883, as given in the lately completed "Zoologischer jahresbericht für 1883, herausgegeben von der Zoologischen station zu Neapel," under the careful editing of Dr. Paul Mayer and Dr. Wilhelm Giesbrecht (abtheilung 1, 1885; 2, [arthropoda], 3, 4, 1884), Leipzig, W. Engelmann, shows how rapidly our knowledge of insect forms progresses, and consequently also our collections are enriched by new species. According to this index the majority (455) of the 625 new genera among the insects belong to the coleoptera and lepidoptera, to the former 254, to the latter 201; the remaining 170 being divided as follows: the hymenoptera 70, hemiptera 46, neuroptera and amphibiotica 27, diptera 18, orthoptera and thysanura 8 genera.

This certainly astonishingly high number of new genera for a single year must attract all the more attention because all the other divisions of the animal kingdom together can boast only of 446 new genera during the same year.—*Entom. nachrichten*, June 1885, jahrg. 11, p. 191.

WHAT IS INVOLVED IN THE PRODUCTION OF A KILOGRAM OF HONEY.—Alexander Wilson, of Dublin, has lately published interesting details upon the amount of sugar contained in the nectar of different flowers, and upon the harvest which honey-collecting insects make. He calculates that 125 heads of clover blossoms, containing about 60 flowers in each head, or 7,500 blossoms, yield about 1 gram of sugar; the nectar from 7,500,000 flowers is necessary therefore to furnish a kilogram of sugar; but as out of every 100 parts of honey only 75 parts are sugar, a kilogram of honey exhausts in round numbers 5,600,000 flowers; and the bees of a hive must visit this enormous number of flowers to collect a kilogram of honey.—*Deutscher bienenfreund*, Feb. 1885, p. 60.

Since a colony of bees may make 30 or 40 kilograms of honey in a season of 90 days they must at this rate visit more than 2,000,000 flowers a day, but as a colony often contains 40,000 workers and a worker bee often visits 50 flowers in less than half a day, this calculation is not unreasonable. The amount of nectar in flowers varies very much with the flowers, and with conditions of weather and other conditions. *A. J: C.*

The almost unnoticed work of domesticated honey bees produces more than 15 million kilograms of honey yearly, in the United States, which, at the above estimate, implies an amount of labor hardly to be imagined.

NEW TEXT-BOOK OF ENTOMOLOGY.—Swan, Sonnenschein & Co., Paternoster square, London, announce the publication of "An elementary text-book of entomology," with 87 plates by Mr. W. F. Kirby, of the British museum. The publishers, in their circular, which is accompanied by a specimen of the first seven plates, containing 80 well-executed wood-cuts of coleoptera, make the following statement: "The object of the author of this book has been to prepare a portable handbook, freely illustrated, in which a number of the most typical and remarkable insects of all parts of the world should be popularly described and figured. Previous works of this nature have generally treated only of a limited group of insects, or of British insects. Unnecessary technicalities have been carefully avoided, and sufficient space has therefore been gained to give a short and readable, though necessarily somewhat condensed, account of all the more important families of insects. The classificatory and illustrative character of the work has been carefully made its chief aim throughout." The price in cloth, gilt top, is fixed at 15 shillings.

G: D.

LYCAENID LARVAE IN ANTS' NESTS. The *Entomologisk tidskrift* for 1884 (p. 227) records that at the meeting of the Entomological society of Stockholm, held 1 Oct. 1884, Prof. C. Aurivillius "communicated the discovery

which he had made in northern Småland of six chrysalids of *Lycaena argus* L. under the bark of a spruce which was inhabited by *Lasius niger*. The chrysalids were found in the cavities made and frequented by the ants and had envelops of an uncommon tenuity and transparency. As it is difficult to attribute the presence of these chrysalids in the colony of ants to any fortuitous circumstance, it is likely that it has some connection with the secretion of a sugary moisture which has already been observed in some larvae of *lycaenidae*. Miskin reports that the larva of *Ogyris genoveva*, a large lycaenid from Australia, is entertained and taken care of by ants in the same way as are the aphides in our own country. An identical fact has also been shown in North America. It is also probable that, as a recompense for this sugary liquid, the ants lodge the larvae of *Lycaena argus* L. during their pupal state when they have their principal need for protection."

APHIS NECTAR AND HONEY. The nectar secretion from aphides is a well-known product. In many cases, however, notably the larch plant-louse, the lice so mimic the twigs on which they rest, that their presence is hard to detect, especially as the lice are often confined to the upper branches of the trees. Often this nectar is secreted so abundantly, that the leaves, and the grass beneath the trees, are covered at early morning by drops so large that it is easy to collect a considerable quantity of the nectar. Sufficient of this nectar can be secured directly from the larch lice and the elm cock's-comb gall lice to test it. Bees are also known to gather it in large quantities. This Aphis nectar is very pleasant and wholesome, and unquestionably forms at times no inconsiderable portion of our most beautiful honey. Such honey is light-colored, pleasing to the taste, and perfectly safe as a winter food for the bees. The truth of this statement is sustained by the fact that the bees work freely on such nectar, even though the flowers are yielding abundant nectar at the same time. The bees themselves practically proclaim the excellence of this nectar.—*Science*, 23 Jan. 1885, v. 5, p

HABITS OF SPIDERS. The followin is extracted from a partial translation 3825] of Dahl's "Beiträge zur biolo spinnen" (Zool. anzeiger, 3 Nov. 1884, 7, p. 591-595), as it appears in the *Ann magazine of natural history* for Jan. 1

"It has often been asserted that th metrical spiders do not repair old webs however, is true only in a limited sens outer framework and some of the radii have become nearly free from trar threads are probably always used ag *Zilla x-notata* and others. The rest i ered up, worked into a ball with the and thrown away. If the spider rem lifeless object from the web, and dama latter in so doing, it certainly sometir produces the destroyed portion of the work, the radii, and the central shelt we interrupt a spider in the formation web, by tearing away a portion of it w corresponding part of the outer fram all will be completed up to the part th remained uninjured. In this case the c tion of the framework is especially ir ing, as this unaccustomed work is not successfully performed at once. Here very distinctly how reflection comes int I was still better able to ascertain refl or, what is the same thing, actual inf in the case of *Attus arcuatus* Bl., whe fered it flies touched with oil of turp Sometimes the spider despised the spe fly employed (*Homalomyia canicularis* whilst it attacked other insects (e. g. *nomus tendens*, Fab.) just as before. spider also draws similar conclusions i cases in which it cannot overcome ins consequence of their chitinous armor too hard. These it usually attacks only and is then for a long time forewarned. gerous insects, however, such as smal it avoids, without having seen their Here therefore we have an instinctive Bee-like flies are equally dreaded."

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JULY–SEPTEMBER 1885.

CONTENTS:

ADVERTISEMENTS 302
NOTES ON MELITTIA CUCURBITAE AND A RELATED SPECIES — *Samuel Hubbard Scudder* 303–304
THE LARVAE OF OESTRIDAE — *Friedrich Brauer* 305–310
WAXY SECRETIONS OF PSYLLID LARVAE 310
PROCEEDINGS OF SOCIETIES — Entomological Society of London . . . 311–314
BIBLIOGRAPHICAL RECORD. no. 3885–4057 315–326
ENTOMOLOGICAL ITEMS 327–328

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PSYCHE.

NOTES ON *MELITTIA CUCURBITAE* AND A RELATED SPECIES.

BY SAMUEL HUBBARD SCUDDER, CAMBRIDGE, MASS.

THE tolerably full account of *Melittia cucurbitae* recently given by Mr. J. A. Lintner in his second Report on the injurious insects of New York recalled to me some observations made on the ravages of this insect in the squash vines on Cape Cod, and from my notes made at the time, now more than twenty-five years ago, I condense the following statement.

My examination was made in the early part of September, and there were to be found at that time two kinds of aegerian larvae within the plants, a larger and a smaller, and in the ground were found cocoons containing larvae of the larger kind—which subsequent observation showed remained through the winter without changing to chrysalis, and also a number of pupal exuviae protruding from the surface of ground which had not been hoed for a month or more.

There are thus apparently two species of aegerians destructive to the squash, and it seems to be probable that the one represented by the smaller larvae and the chrysalis-skins is either a later appearing species or that it is double-brooded, the brood represented by the smaller larvae in September being the later. There can be little doubt that both were aegerians, as they agreed closely in all structural peculiarities, and they could hardly have been different stages of the same species, since they differed so much in the color of the head and thoracic segments and in the general markings. The following description of the larva of *M. cucurbitae*, fuller than before published, is drawn up from my notes.

Head very dark brown, deepening into black, with a median white band reaching to the frontal triangle and passing down its sides; a few scattered hairs are seen. Body white, the dorsal vessel visible through the cuticle, the surface smooth, but with two or three hairs on each segment, and on the terminal segment some faint light brown spots and four backward-projecting hairs. The first thoracic segment has on the dorsal surface two oblique, curved. light brown bands, nearly meeting posteriorly, their concavities outward; between their extremities on the front of the segment are a pair of transverse, almost microscopic, semicircular lines opening forwards. On second and third thoracic segments (my notes fail to say whether above or below) a transverse row of hair-bearing, scarcely perceptible, tubercles. Legs light brown; in place of prolegs, rings of black bristles. Spiracles light horn-color, surrounded by white, and this by a horny areola. Length 25 mm; breadth a little more than 6 mm.

As this and the smaller larva were at first taken for different stages of the same species, the difference in their habits was not so carefully noted as it should have been. The present species was, however, by far the more destruc-

tive, being ten times more numerous than the other; nearly forty were taken from the inside of a single plant, they being found concealed in all parts from below the ground as far as they could burrow, to the base of the leaf stalks, and some were even in the squash itself; besides these, in the hill in which the same plant was growing, over twenty larvae were found in their chrysalis cases. They cast most of their excrement through holes eaten to the surface of the stalks. They appear to commence their work near the surface of the ground, and to work their way in each direction.

When ready for their change, they eat their way out of the stalk, reach the ground (probably by a thread, for they can spin one) enter the ground and make their cocoon there; this is formed externally of grains of earth adhering to silk, and is of considerable stoutness though very thin; it is of a light brown color within and blackish without, so that when the earth is removed, the cocoon has a reticulated appearance, from the brown showing through the black; the innermost layer of all is white. Some of these cocoons were kept, and the larvae were living within them on the 26th of the following May, having remained unchanged in the larval condition throughout the winter. They subsequently died. Thirty or forty cocoons were opened in the hills only to find the larva within.

This is all the history of this species which was followed. The second species has very nearly the same habits, excepting that it perforates the of the leaf stalks themselves and li the leaf stalks, often curled up. *cucurbitae* was also found there bu so frequently, and the present sp seemed to prefer in addition the h parts of the plant, such as the jun of the leaf and stalk, of the leaf and main stalk, etc. The followi a description of the smaller specie

Head jet-black. Body white, with a dusky stigmatal band. Upper surface c thoracic segment nearly black; a tran series of eight brown spots on each se behind the first, two faint ones being d one on each side infra-stigmatal, an others pleural; those of the thoracic are much the most conspicuous, and c abdominal rings there is a brown dot or ring in front of and a little within the c spots; the last segment is brown above spots similar to those of *M. cucurbita* more distinct; hairs as in that sp Length 13 mm.; breadth 2.5 mm.

No difference was noted betwee cocoons beneath the surface with l larvae (*M. cucurbitae*) and tho the present species which were emp the chrysalis forcing off (how?) th tire end of the cocoon, and by m of the hooks on the abdominal working its way to the surface single larva, kept in captivity, ma cocoon in a small box partly filled earth, and it was noted that the co was thinner than that of *M. cucurb*

Brief additional notes on *M. cu bitae* will be found in Papilio, v. 50, by N. Coleman; and in Bull. Br lyn entom. soc., v. 6, p. 10, by G Hulst.

THE LARVAE OF OESTRIDAE.

BY FRIEDRICH BRAUER, VIENNA, AUSTRIA.

[Translated by B: Pickman Mann from Friedrich Brauer's "Monographie der oestriden," Wien, 1863, p. 35-40.]

The larvae of the *oestridae*, although in many cases quite peculiarly shaped, are so nearly related to the larvae of the rest of the *muscidae-calyptera* that it has not yet been possible to discover for them a constant distinguishing character founded upon their structure. The reason of this lies in part in the oestrid larvae themselves, since they are very different among themselves, and in part also in our defective knowledge of the muscid larvae.

At present, it is true, no real muscid larvae are known with large thorn-warts,—as I will call the dermal formations which occur in many oestrid larvae, which are conical, soft at the base, fleshy, and corneous at the tip,—also none with the characteristic stigmatal plate of the *Gastrophilus* larvae; on the other hand very many are known with thorns, like those of *Dermatobia*, or naked, like those of the young *Hypoderma*, or with horny stigmatal plates, like those of *Cephenomyia*. The remarkable parasitic method of life in mammals can probably be looked upon as peculiar to the *oestridae*. I leave it therefore to a future observer to establish a character for the oestrid larvae whereby they may be distinguished from all other muscid larvae, and limit myself here to the description of the larvae according to genera and species.

The oestrid larvae belong to the great division of those dipterous maggots which have been called headless, since they are segmented throughout and the usual regions of the insect body are not separated. Only a cephalic and an anal end, therefore, can be distinguished on the annulate body of such larvae. In general the following common characters and peculiarities of the oestrid larvae can be specified.

1. The body of all oestrid larvae is really composed of twelve rings. The first two are however not always distinctly separated, so that I take them together in the description, and designate them both by the name of cephalic ring, on which in many cases an anterior and posterior section is clearly to be distinguished. On that account I assume only eleven segments, as earlier authors have done. Only the newborn larvae of *Gastrophilus* make an exception to this number; they, if Joly's statement is correct, possessing thirteen segments.

2. Two anterior, external breathing-organs are always to be distinguished on the larvae, between the first and second segments of the body, and two posterior, external breathing-organs on

the last ring. The former are very small and appear either as points, knobs or fissures, or the anterior ends of the tracheae are hidden entirely in a cylindrical invagination of the skin (*Gastrophilus*). The posterior breathing-organs are either breathing-tubes which are protrusile and retractile (new-born *Gastrophilus* [p. 36] larvae and *Cephenomyia* larvae), or large stigmatal plates which are constructed according to two kinds of types. One of these types is represented in *Gastrophilus* and *Dermatobia*, the other in the rest of the genera. The stigmatal plates are more or less protected by lip-like organs on the last ring or by withdrawal into the preceding ring, and are in this way cleaned from substances which adhere to them.

I have described in detail under that genus the structure of the posterior stigmatal plates in *Gastrophilus*. The majority of the genera possess however two stigmatal plates in a real sense, consisting of corneous chitinous substance on the last ring. Each ring is usually crescent-shaped or reniform, in younger larvae even quite circular, and appears when magnified either as latticed with coarse meshes, finely porous or almost smooth, sometimes radially furrowed. On the inner border of each plate is in all larvae in the third and in many in the second stage a thinner, membranous or knob-like place superposed or imbedded, sometimes enclosed in the plate itself. The attachment of the trachea corresponds to this place on the inside. Since it usually has the appearance of an opening, and also has been taken for such, I call it the false stigmatal opening. It has not yet been ascertained without doubt that breathing goes on in such stigmatal plates, but it probably takes place through pores of the plate. It seems to me as if the plates were penetrable especially at the circumference of the attachment of the tracheae.

3. The new-born larvae all possess external mouth-parts; in the later stages larvae with oral hooks and those without them are to be distinguished. An internal pharyngeal framework of various development always occurs; this encloses the membranous gullet and by its muscular structure is of essential service in the sucking of the larva. If oral hooks are present, they are connected with this by a joint.

Usually a U-shaped, bent chitinous plate is to be seen, whose open side looks upward; from the side it has the shape of a sitting butterfly whose large upper wing reaches far back and has the smaller, narrow under wing under it. Since the wings of the two sides are grown together firmly underneath, the whole pharyngeal framework appears like a flying insect, when the wings are bent apart from above, and with the base in a plane. The part lying more or less in front, which is to be found in the middle between the wings, and which really radiates out into these, or is united with them like a ligament, is what Schroeder van der Kolk calls the tongue-bone.

In the pharyngeal framework there-

fore there can be recognized a body (Schroeder's tongue-bone) and four wing-like processes which often again consist of several parts. The body is connected with the wings posteriorly. It is always bent in a U-shape, and so that the open end looks upward, *i.e.*, if other soft parts of its vicinity which also close this are disregarded. [p. 37] Bent flat, it shows a more or less distinctly H-shaped chitinous plate, with very broad side parts, which—in full-grown larvae—become confluent behind into a simple, broad plate, and only leave an oval hole in front of them for the passage of the discharge duct of the salivary glands, but posteriorly bear the four wing-shaped processes (two large upper, or in the outspread plate outer ones, and two smaller slenderer inferior or inner). On the anterior end of the body, in many genera, oral hooks are jointed to the short anterior side parts. In the anterior curved excavation of this lies in the membranous expansion a small corneous chitinous plate which is pierced like a sieve and whose nature has not yet been more closely investigated. It seems to me as if this plate lay at the outlet of the salivary ducts. It is especially distinct in *Cephenomyia* larvae. It is wanting in several others.

In young larvae the pharyngeal framework consists only of two chitinous rods which are united in front by a chitinous band; these chitinous rods radiate out behind in little wings. A (similar) pharyngeal framework occurs in all other muscid larvae, and corresponds in the perfect insect to the chitinous frame of the proboscis. I have repeatedly convinced myself that such is really the case, since I have opened the coarctate pupae of *Cephenomyia* and *Gastrophilus* before the emergence of the flies. Since in these genera, as we will see later, the nymph is tightly enclosed by the puparium, it can be noticed how the already freed pharyngeal framework, which remains attached to the puparium, rests in the mouth-fissure of the nymph, and is drawn out of it as soon as the nymph is taken away or the lower lid is lifted off. It is also easy to form an idea that the pharyngeal framework together with its internal parts corresponds to the proboscis of the fly if it is observed how other muscid or syrphid larvae while alive project and withdraw this exactly as the fly does its proboscis.

In *Hypoderma* the mouth-parts undergo a retrograde metamorphosis from the second stage (after the first molt); the oral hooks disappear, and therewith all the external mouth-parts, but the internal pharyngeal framework remains.

4. The oestrid larvae show antennae (at least rudimentary ones) above the mouth-parts; these have the appearance of corneous or usually membranous knobs, and in the latter case are provided with one or two ocelli-like points. Subulate, many-jointed antennae, such as occur in many muscid larvae, are never found.

5. All possess an anus, which lies on the last ring, under the stigmatal plates, and is very small.

6. They molt twice while they are parasitic. I have observed most closely the molting in *Hypoderma* larvae of the second stage. In *H. diana* the passage from this stage [p. 38] to the last one takes place about the beginning of February. If in a cutaneous muscle which is richly larded with such larvae the capsules of those larvae whose hinder stigmatal plates have the shape of the third stage, but are still clear yellowish-brown, are carefully slit open, the skin characteristic of the preceding stage, with the many little thorns heaped in groups, will be found either still partly attached to the front end of the larva or entirely dependent from the cephalic end or folded together along the dorsal side. The process of molting seems to be entirely similar to that in the *Melophagus* larvae; at least Leuckart states that the old skin in these is shoved together toward the cephalic end of the larvae and there remains attached. The *Hypoderma* larva, immediately after the molt, is pure white, very soft, and appears naked, since the thorns do not become dark and distinctly separated from their surroundings until they harden.

Three forms or stages are to be distinguished, corresponding to the molts, which forms in *Hypoderma*, *Gastrophilus* and *Dermatobia* show great differences. In the third stage the larvae reach their full size, usually change their color and that often very considerably, and then first leave their host-animal, crawl away and pupate, after the manner of the *muscidae*.

7. This pupation must be cc ered as a third molting, in which, ever, the skin is only detached a the pupa, but is not stripped off remains in connection with it by n of four tracheae. The hardened l skin, or puparium, is burst open cephalic end by the emerging f means of the frontal bladder filled fluid, in the direction of the ar sutures in a double manner. Alth the pupation resembles herein th the *muscidae* in general, yet the curs in one part of the *oestridae*, in *Hypoderma*, a peculiarity whic not been observed before, namely the larva transforms in the pupa in a completely outstretched cond and this therefore is far larger tha insect which comes forth from it.

8. So far as they have been obse they lead a parasitic life in mam and feed upon the juices of these mals. In *Hypoderma* a blood-re testine often shows through, and likely that these sometimes suc blood in addition to the exudation w immediately surrounds them.

9. The closely observed larva show at first a slow and finally a development, so that there occ resting stage which often lasts s months, between the swarming o imago and the first visible appea of the larvae.

The larvae of the *oestridae* were merly divided into two groups: int vae with oral hooks and those wi external mouth-parts. Such a se tion is of service in distinguishin

full-grown larvae, but scientifically unnatural and incorrect, since in the first place this peculiarity of the full-grown larvae corresponds to no similar degree of relationship of the perfect insects, and in the second place it is only temporary, [p. 39] since all oestrid larvae possess oral hooks when they are quite young. Such a division also as Clark attempted to make, into *cavicolae*, *cuticolae*, and *gastricolae*, is inadequate, for while the species of a genus do indeed always agree in life-history so far as their occurrence as parasites in a determinate organ is concerned, nevertheless the larvae of very different genera may also share this same manner of life with others; for instance, *Hypoderma*, *Cuterebra*, *Dermatobia*, among which there is far more difference between 1 and 2 than between *Cuterebra* and *Cephenomyia*, if the imagines are considered. Such a division is therefore likewise not a natural one, since it disturbs the natural relations of affinity. Two elements must be considered, in order to bring about an approximately natural division: in the first place the organization of the larvae, and in the second place their manner of life; and the latter in a subordinate degree, though this is here more important than in other animals, since as yet there is no example of two species of *oestridae* of one genus having been found parasitic in different systems of organs. Thus the *Cephenomyia* larvae belong to the oesophagus, the *Cephalomyia* and *Oestrus* larvae to the nasal and frontal cavity, those of *Gastrophilus* to the intestinal tract, and those of *Hypoderma* to the subcuticular cellular tissue.

Although it is stated that the larva of *Gastrophilus* has been found in the oesophagus, this is one of the exceptional cases which are not authenticated. Of course only the full-grown larva is meant here, since young larvae may always be found in other places during the immigrations. So for instance the young *Oestrus* and *Cephenomyia* larvae both immigrate in like manner through the nose, and their roads do not separate until they get there, but the former migrate into the frontal cavity, and the latter into the oesophageal cavity.

Of the organs in which *oestridae* occur, the skin, or really the subcuticular cellular tissue, is that which is the most strongly attacked; the larvae of four genera: *Hypoderma*, *Oestromyia*, *Dermatobia*, *Cuterebra*, live in it. The nasal and frontal cavity are inhabited by the genera *Cephalomyia* and *Oestrus*, the nasal and oesophageal cavity by the genus *Cephenomyia*, the intestinal canal by the genus *Gastrophilus*. The transformations of the other genera of *oestridae* are unknown.

It is interesting farther that many genera occur only as parasites of certain families of mammals, while others have a somewhat wider or very wide range of distribution, and so have for hosts the different mammals, yet not quite without choice, and often even seek men for their breeding places.

Thus until now the larvae of *Cephe-*

nomyia have only been found in the throats of *cervina*, those of the genera *Cephalomyia* and *Oestrus* only in *tylopoda* and *cavicornia*, those of the genus *Gastrophilus* in *solidungula* and *multungula* (*Rhinoceros*), but *Hypoderma*, on the other hand, in *cavicornia* (*Bos*, *Capra*, *Antilope*), *cervina* (*Cervus*, *Moschus*), and *equida*, *Cuterebra* larvae in *rodentia* and *marsupiala*, and finally those of *Dermatobia* in dogs, oxen, horses, and even upon man.

[p. 40] Another picture is formed if the perfect insects are divided according to a peculiar character into those with pectinate antennal bristles (*Cuterebra*, *Dermatobia*), and those with naked antennal bristles (*Hypoderma*, *Gastrophilus*, *Cephenomyia*, *Cephalomyia*), since the larvae of the former are parasitic in ungulate animals as well as especially in *rodentia* and *marsupialia*, but those of the latter only in *ungulata*. This hitherto so convenient and practical division likewise cannot be relied upon for an inference, since *Oestrus leporinus* belongs to the group of *oestridae* with naked bristle, but its larva lives upon a rodent. It is seen that such divisions are only artificial and serve for orientation, but that nevertheless nature cannot be forced into them. Such divisions are therefore only temporary, and only too often become untrue so soon as new discoveries are published. It is therefore best to treat of the larvae according to their genera, and to limit these as naturally as possible, since it has thus far been found constantly in this family that the larvae of one genus all have a like life-history, and conversely the generic characters of the imagines can scarcely lead us astray if we wish to draw an inference as to the life-history of a larva perhaps not yet investigated. In the case of a new genus, however, we can infer its life-history with very little certainty. Experience alone teaches this.

WAXY SECRETIONS OF PSYLLID LARVAE. Dr. Franz Löw, in his "Beiträge zur kenntniss der jugendstadien der psylliden" (Verhandl. K.-k.zool.-bot. gesells., 1884, v. 34; Abh.), p. 144, thus describes a curious secretion in the larvae of *Psylla ulmi*: "From wax-glands surrounding the anus the larva emits a white secretion, which appears as a hollow, vermiform thread that allows the passage through it of the fluid excrement of the larva. This white thread, which reveals the presence of the larvae hidden in the axils of the leaves behind the stipules, elongates continously, but breaks off repeatedly on account of its own weight and consequently reaches no very considerable length. Furthermore this larva secretes from the wax-glands on the dorsal surface of the last abdominal segment extremely fine white threads, which form unitedly a very loose, light flock." The larvae of *Trioza*, three species of which larvae are described in the same paper, have their entire outer margin surrounded by hyaline, silky, very fine, threads of wax, which lie close to one another, and seem to form a short, closely-trimmed fringe around them.

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PROCEEDINGS OF SOCIETIES.

ENTOMOLOGICAL SOCIETY OF LONDON.

6 JUNE 1883.—Prof. J. O. Westwood, the honorary life-president, read an address, upon taking the chair, in which he briefly reviewed the progress entomology had made in times within his remembrance.

Mr. Frank Cheshire, who was present as a visitor, made some observations on section-cutting of the probosces of honey-feeding insects, as referred to by Prof. Westwood in his address. He recommended that the insect to be operated upon should be kept fasting for some time and then fed upon honey mixed with gelatine impregnated with some highly colored dye; the insect should be immediately decapitated and the head rapidly cooled; it should then be embedded in gelatine and the section cut by means of the microtome. The mouth-passage is then easily seen from the presence of the dye. Mr. Cheshire then made some extended remarks on his various observations upon the minute structure and anatomy of the honey-bee, stating that many of his results differed much from the generally received authoritative statements. With regard to the tongue of the honey-bee, many authorities regarded it as a tube through its entire length, others as a gutter or trough, while in reality it is a trough on the upper side at the apex and a tube for the rest of its length; the structure of the extreme apex (Réaumur's "bouton"),—about which there existed so much difference of opinion,—was easily made out by the use of the means Mr. Cheshire recommended.

4 JULY 1883.—Miss E. A. Ormerod exhibited a bunch of *Atherix ibis*, Fabr., found on a sprig of alder [*Alnus*] overhanging water at Hampton Court by Mr. J. Arkwright. The swarm of flies measured about 6 in. [15 cm.] long by 3 in. [7.5 cm.] broad, and consisted of many thousand specimens.

Mr. E. A. Fitch called attention to a figure of a similar swarm of this species in the Compte-rendu of the Société entomologique de Belgique, for July 4th, 1874.

Mr. W. L. Distant exhibited specimens of four of the five known species of American *fulgoridae*. Three were from Central America.

Mr. G. C. Champion stated that in Central America he had kept forty or fifty specimens of *fulgoridae* alive for days, and had seen no trace of luminosity, neither did they stridulate; the evidence of the natives also was quite against these insects being luminous. The *fulgoridae* were very sluggish in their habits, Mr. Champion observing that he commonly found specimens on the trunks of trees, where they sometimes remained for days; he had never seen a specimen on the wing. Mr. Champion also related that he had not infrequently found larvae attached to and feeding on the white cottony secretion so abundant about some of the smaller *fulgoridae;* he had found as many as three larvae attached to one imago.

Prof. Westwood commented on the great interest of this last announcement, remarking that the three cases of lepidopterous parasitism on the *fulgoridae* already recorded by him (Trans. Entom. soc. Lond., 1876, p.

519; 1877, p. 433) occurred on eastern species. He was glad to hear that Mr. Champion had sent home specimens of the parasitic larvae, and hoped that further information would be attainable.

Mr. G. Lewis remarked on the different forms existing in the various species of *lucanidae*, and stated that he believed these were due to the food of the larvae—whether the diet of the individual larva was nutritious and abundant or otherwise.

Prof. Westwood remarked that the great modifications in the size, curvature, deflection and dentition of the mandibles in male *lucanidae* required great caution in not too hastily assuming identity of species in cases of great individual divergences.

1 AUG. 1883.—Sir Sidney Saunders communicated the purport of two letters addressed to him by M. Edmond André, of Beaune, upon the subject of the terminal segments "des chalcides à queue"; stating that, after further investigation, he concurred in considering Sichel's so-called *hypopygium* in those genera (Proc. Entom. soc. Lond., 1882, p. 26, fig. 7D) as a conjoint segment comprising the dorsal and ventral arcs of the 7th. This he intends to notice in the Annales of the French entomological society.

Mr. R. Meldola read notes from Dr. Fritz Müller, on the following subjects: "Persecution of distasteful butterflies by birds," "The colour of the pupa of *Papilio polydamas*" [showing that the green or brown coloration of the pupa does not depend upon the color of the object on which it pupates], and "How the caterpillar of *Eunomia eagrus*, Cram., employs its hairs" [showing by a figure how this glaucopid moth distributes its hairs each way from the pupa along the twig on which it pupates in order to defend the pupa from ants and non-flying foes.][1]

[1] The last two papers are printed in German under the titles "Die farbe der puppen von *Papilio polydamas*" and "Wie die raupe von *Eunomia eagrus* ihre haare verwendet" in Kosmos, March 1883, jahrg. 6, v. 12, p. 448-449.

5 SEPT. 1883.—Mr. F. Enock exhibited a perfectly bilateral hermaphrodite *Macropis labiata*, Panz., the antennae, face, palpi, mandibles, legs, and genitalia showing very characteristically; the right side was male, the left female. [This bee is figured (Trans. Entom. soc. Lond., 1883; Proc. p. 25)].

In discussion, *Vanessa cardui*, L., *Pantala flavescens*, Fabr., and the trimorphic forms of *Nezara viridis*, L., were mentioned as being of cosmopolitan distribution, and *Danais archippus*, Fabr., was instanced as a species which had but lately taken to migration, being now found in Britain, the Azores, New Caledonia, and various oceanic islands, where it was previously known not to occur.

3 OCT. 1883.—Mr. W. F. Kirby, on behalf of M. Alfred Wailly, who was present as a visitor, exhibited a large box containing numerous bred specimens of various silk-producing *bombycidae*. . . . One extraordinary specimen of a *Samia* was very notable; . . . on this Mr. Kirby read a note entitled "Abnormal specimen of the genus *Samia*." [This note, describing the specimen in detail, is printed in Trans. Entom. soc. Lond., 1883; Proc., p. 27. Concerning this specimen and description the following remarks are furnished to the editors of PSYCHE:—

ABNORMAL SPECIMENS OF SAMIA AND ALLIES. The *Samia* described by Kirby is nothing but a suffused aberration of *cecropia*. It emerged from a cocoon received among many others of *cecropia* from the United States by Mons. Wailly, of London, Eng., who afterwards disposed of the moth to Mons. Godeffroi Mollinger, residing in the Netherlands. The latter sent me at the time an excellent, full size photograph of the insect, from which I saw in a moment that it was an abnormal *cecropia*. I have two agreeing with it almost exactly, save that they are not so large; have also seen another in a collection in New York that is nearly like it; in fact those things are not such rarities; almost any one who breeds large numbers of this or other species is likely out of the number to find some such monsters,

or "Spielarten" as the Germans designate them. I have at various times bred or acquired otherwise examples of *Telea polyphemus* destitute of the ocellate spots of the primaries; also of endless variety of color; of *Antheraea yamamai* I have some sulphur, others olive, and one black; of *Tropaea luna* some with two ocelli on *one* upper wing, and one without ocelli on any of the wings; and so on, I might go on enumerating hundreds in my own possession, besides many more scattered in various collections over the world.—Herman Strecker, Reading, Penn.]

5. DEC. 1883. — Mr. F. P. Pascoe exhibited some remarkable insects' nests from Delagoa Bay. They varied from half an inch [13 mm.] to an inch and a quarter [32 mm.] in length, and in shape from globular to ovate. They were semitransparent, yellowish, and the surface, under a lens, had a reticulate appearance; on one side, from the base to the apex was a stout suture, to which was attached a septum extending about two-thirds across the interior; on each side of this septum, but away from the suture, were placed in an erect position about 120 cylindrical eggs. These nests had much the appearance of the dried pods of the "bladder senna;" they were retained by a movable loop to the slender twigs of a shrub which Sir Joseph Hooker had pronounced to be a *Rhamnus*.

Mr. R. McLachlan considered that these curious bladder-like egg-cases belonged to one of the *mantidae*.

Mr. Wood-Mason did not think they should be attributed to the *mantidae*, altho possibly it might be so; he pointed out that the eggs were arranged in quite a different manner to those of any *Mantis* he had seen. He also suggested that the large vacant space existing between the egg-mass and the outside of the capsule would probably be protective against parasitic insects. — *Abstracted and compiled from Trans. Entom. soc. Lond., 1883; Proc., p. 13–35.*

2 APRIL 1884.—Mr. H. J. Elwes read a paper, "On the genus *Parnassius*," especially referring to the anal pouch in the females as a specific character, and to the geographical distribution of the species; and made some remarks on their life-history. Mr. Elwes commented on the fact that almost every systematic writer except Boisduval had entirely overlooked the presence of the anal pouch. He illustrated his remarks by numerous diagrams, and by the exhibition of specimens of every known species and form occurring in the genus.

Lord Walsingham communicated a paper on "North American *tortricidae*." [Rec., 3938.]

7 MAY 1884.—Mr. W. F. Kirby exhibited a remarkably small and dark variety of *Samia cecropia* Linn., bred by Mr. Alfred Wailly.

Mr. A. S. Olliff exhibited a new species of *Helota*, collected in Angola by Dr. Welwitsch. The genus was previously known only from eastern Asia. Mr. Olliff said that Lord Walsingham had pointed out to him a similar and equally unexpected case of geographical distribution in the genus *Deuterocopus* of Zeller, belonging to the *pterophoridae*, which up to this time had only been known from Java, and of which he has lately received an undescribed species from Bathurst, West Africa.

Mr. A. G. Butler communicated a short paper by Mr. A: R. Grote entitled, "Note on the North American genus *Hemileuca*."

Mr. W: H. Patton communicated "Some notes on the classification and synonymy of fig-insects."

2 JULY 1884.—Dr. Fritz Müller (of Blumenau, Santa Catharina, Brazil) and Dr. A. S. Packard (of Providence, Rhode Island, U. S. A.) were elected honorary members of society.

Mr. T. R. Billups exhibited specimens (some living) of *Pelopaeus architectus*, and its nest, which was found attached to a leaf of tobacco from Owensboro, Kentucky, and taken from a hogshead recently opened at Whitechapel, England.

Mr. W. F. Kirby said that he had seen a

nest similar to the one now exhibited attached to a pod [ear] of maize.

Mr. T. R. Billups stated that he had frequently witnessed encounters between the larva of *Ocypus olens* and earthworms, and had kept *Carabus auratus* alive on nothing but earthworms for more than five months.

Dr. D: Sharp remarked that *Cybister roeseli* had been kept alive from five to seven years by being fed on earthworms once or twice a day; he thought .... that earthworms were the favorite food of carnivorous coleoptera.

Mr. W. L. Distant exhibited an ordinary specimen of *Cilix spinula*, and remarked that though its peculiar position when at rest had been described, it had not been noticed that it thus perfectly resembled a species of the homopterous genus *Flata*. ... He further remarked that the term "mimicry," recently loosely-used, could not be applied here, as the moth could hardly be considered to mimic a *Flata* which did not occur in our fauna.

Mr. E. A. Fitch called attention to the great resemblance that *Cilix spinula* bore to the excrement of a bird, when at rest on the upper side of a leaf, as was its common practice.

Mr. A. G. Butler remarked on the great similarity sometimes existing between lepidopterous and homopterous insects; he had lately described a lithosiid allied to *Nudaria*, from New Holland, which he certainly thought at first was a homopteron; the resemblance was so striking that he had named the genus *Homopsyche;* the hairs along the costa were very striking, and he quite believed this was a case of mimicry. Quite lately he had found a second specimen in the [British] museum collection, which had been put away in the supplementary cabinet as not a lepidopterous insect.

Mr. F. P. Pascoe, in connection with the above, exhibited a large and pretty chalcid (which Mr. Fitch determined as one of the *cleonymidae*), which he had lately captured at St. Helier's, quite thinking it was a hemipteron; when running it had its wings overlapping in true bug fashion.

Miss E. A. Ormerod exhibited a piece of leather perforated by *oestridae*, the punctures being more than one to the square inch [16 to the square decimetre]. Miss Ormerod called attention to what is known of the life-history of our bot-flies, and especially of the warble-fly (*Hypoderma bovis*), and alluded to the practical necessity of attempting to lessen the amount of injury occurring both to the cattle themselves and to the hides.

Messrs. W. L. Distant, E. A. Fitch, and C: V. Riley made further remarks upon the same subject.

Mr. A. Wailly exhibited a large box of bred lepidoptera, especially of silk-producing *bombyces*. Amongst them ... were larvae hybrid between *Samia cecropia* and *S. ceanothi* (*californica*); the parents had paired without forcing in any way, but no pairing between the sexes of *S. ceanothi* could be obtained; he believed these larvae would produce *S. gloveri*. ...

3 SEPT. 1884.—Mr. W. F. Kirby, on behalf of Mr. A. Wailly, who was present as a visitor, exhibited ... cocoons of *Ceratocampa imperialis*, and Mr. Wailly said that his suspicions that this larva was a cannibal had been fully verified by Mr. E. F. Hitchings, of Warren, Mass., who thus writes respecting this species:—

"In the fall of 1881 I obtained several almost full-grown larvae and put them in a box with plenty of pine and button-wood leaves; in a few days I noticed that several had disappeared, and upon examination found the skins with the juice all extracted. They were all of large size, and I found one or two of these skins held in the manner described by you. I then put in several full-grown larvae of *Telea polyphemus*, and they were disposed of in the same way. This led me to conclude they were carnivorous. In 1882 I noticed the same thing."

(To be continued.)

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard: S: Samuel; T: Thomas; W: William. The initials at the end of each record, o; note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Anderson, Joseph, *jr.* Aphides and their partiality for strongly-scented plants. (Entomologist, June 1885, v. 18, p. 173-174.)

Notes the preference of *aphididae* for strongly-scented conservatory plants, and plants bearing fragrant flowers. *G: D.* (3885)

Ashmead, W: Harris. On a parasite bred from the eggs of the orange tree plant bug; being another insect friend of the orange grower. (Florida agriculturist, 2 Nov. 1881, v. 4, no. 25, p. 193, col. 1-2, 56 cm.)

Describes *telenomus brochymenae*, a new species of *proctotrupidae*, parasitic upon the eggs of *brochymena arborea*, and gives notes on its habits. *G: D.* (3886)

Bailey, James Spencer. The natural history of *cossus centerensis*. (Can. entom., Jan. 1879, v. 11, p. 1-5, pl.)

Figures and describes the larva, pupa and imago of *cossus centerensis;* gives notes on its habits; the larva bores in wood of *populus tremuloides*. *G: D.* (3887)

Barnard, G: Fruit versus sugar. (Entomologist, June 1885, v. 18, p. 160-161.)

Describes the mode of collecting lepidoptera by using fruit, in place of sugaring, as the author has practised in Queensland. *G: D.* (3888)

Barrett, C: Golding. The influence of meteorological conditions on insect life. (Entom. mo. mag., June 1882, v. 19, p. 1-8.)

Abstract, by B: P. Mann, with above title. (Psyche, Sept.-Oct. [16 Nov.] 1883, v. 4, p. 83-87.)

Effect of severely cold winters in promoting the abundance of certain species of lepidoptera, and of wet weather in destroying other species. *B. P. M.* (3889)

Bassett, Homer Franklin. New cynipidae. (Can. entom., 1881, v. 13: April, p. 74-79; May. p. 92-113.)

Describes 24 new species of *cynipidae*. *G: D.* (3890)

Bijerinck, M. W. [Heterogonie der cynipiden.] (Entom. nachrichten, 1 March 1880, jahrg. 6, p. 45-46.)

Notice. (Entom. nachrichten, 1 April 1880, jahrg. 6, p. 71.)

Dimorphism and mode of oviposition of *biorhiza aptera*. *G: D.* (3891)

Bell, James Thompson. [On *alaus*.] (Can. entom., May 1881, v. 13. p. 116.)

Answer to J: L. Le Conte's "[On *alaus gorgops*]" (Can. entom., April 1881, v. 13, p. 80) (Rec., 2888]. *G: D.* (3892)

Berlese, Antonio. Acarorum systematis specimen. (Bull. Soc. entom. ital., 1885, an. 17, p. 121-135.)

Classificatory table of the *acari*, extending to genera; the families are as follows: *demodicidae* (including the *phytoptı*), *sarcoptidae, oribatidae, gamasidae, ixodidae, trombidiidae* and *hoplopidae*. *G: D.* (3893)

Bettany, G. T. The galleries of the cutting ants of Texas. (Nature, 16 Oct. 1879, v. 20, p. 583, 23 cm.) (Littell's living age, 22 Nov. 1879, s. 5, v. 28, p. 512, 33 cm.)

Notes on the habits and habitations of *atta fervens*, based on accounts given by H: C. McCook. *G: D.* (3894)

Biró, Lajos. Szabadban alvó méhek és darázsok. (Rovartani lapok, Aug. 1885, v. 2, p. 169-172; Résumé, p. 23-24.)

Observations on the posture of about twenty species of hymenoptera while asleep upon *centaurea arenaria*. *G: D.* (3895)

Blanchard, F: Note on the habits of *amphicoma vulpina*. (Bull. Brooklyn entom. soc., Apr. 1883, v. 5, p. 90.)

Record of occurrence and diurnal habits of *amphicoma vulpina* at Lowell, Mass. *B: P. M.* (3896)

Brauer, Friedrich. [Entwicklungsgeschichte der *hirmoneura obscura*.] (Verhandl. K.-k. zool.-botan. gesells. in Wien, 1883, jahrg. 33; Sitzb., p. 19.)

Notes on larvae of *hirmoneura obscura* which live in larvae of *rhizotrogus solstitialis*. *G: D.* (3897)

Breitenbach, Wilhelm. Ein neuer feind der honigbiene. (Entom. nachrichten, Feb. 1884, jahrg. 10, p. 42.)

An undetermined hemipteron destroys many honey bees (*apis mellifica*) in southern Brazil. *G: D.* (3898)

Buel, Jesse. The *saperda bivittata*, or apple borer. (Mass. agric. repos. and journ., July 1826, v. 9, no. 2, p. 191-195.)

Communicates a letter from Philip Heartt, describing the ravages of *saperda bivittata*, and a letter from T: Say, concerning the same insect, with a copy of Say's original description of it. *B: P. M.* (3899)

Cameron, P: Descriptions of new species of *tenthredinidae* and *cynipidae* from Mexico. (Trans. Entom. soc. Lond., 1884, p. 481-488.)

Describes 9 new species of *tenthredinidae* and 5 of *cynipidae*, all from Mexico. *G: D.* (3900)

Cameron, P: A monograph of the British phytophagous hymenoptera. *Tenthredo*, *sirex* and *cynips*, Linné. Vol. 1. Lond., *Ray soc.*, 1882. 7 + 340 p., 21 pl., *each with 1 p. expl.*, 27 p. [announcements of Ray soc.], 23 × 14, t 16.5 × 9.7.

Rev. (Ann. and mag. nat. hist., May 1885, s. 5, v. 15, p. 416-417.)

A general monographic work on the British phytophagous hymenoptera, to which are prefixed general statements, which may be comprised under the following heads, about these insects: external anatomy of the head, mouth-parts, thorax, legs, veins and their venation, abdomen, ovipositor, and male anal appendages; spiracles, coloration, secondary sexual characters; habits — such as food, feigning death, copulation, oviposition, and parthenogenesis; the egg, larval habits, list of food-plants of larvae of British species; anatomy of larvae, and the differences between these and lepidopterous larvae; protective coloration of the larvae, offensive secretions and other means by which some larvae are protected; synopsis of the larvae of British species; mode and localities of pupation, and external anatomy of the pupa; generic and specific characters of the phytophagous hymenoptera, their geographical distribution, their classification and literature; analytical tables of genera and species belonging to the British fauna, with descriptions, and notes on habits and habitats of each species. *G: D.* (3901)

Campbell, G: Douglas (GLASSELL), *8th duke of Argyll*. Mimicry in moths. (Nature, 7 Dec. 1882, v. 27, p. 125-126. 24 cm.)

Notice and abstract, by F. P. Pascoe. (Trans. Entom. soc. Lond., 1883; Proc., p. 2).

A moth, of a species unknown to the writer, was observed at Cannes, France, mimicking a crumpled leaf. *G: D.* (3902)

Chambers, Vactor Tcusey. *Cicada septemdecim* in Colorado. (Amer. entom., Mch. 1880, v. 3, n. s., v. 1, p. 77, 2 cm.)

Record of occurrence of *cicada septendecim* in Cheyenne cañon, Colorado, in June 1876. *B: P. M.* (3903)

Chambers, Vactor Tousey. Micro-lepidoptera. (Can. entom., July 1871, v. 3, p. 54-58.)

General remarks on the genus *lithocolletis*, its two forms of larva and the differences in their mines and habits; classification of the known North American species by their coloration, with descriptions of new species; characters, food-plants and habits of six species, of which three (*l. tiliacella*, *l. clemensella*, *l. caryae-albella*) are new, with remarks on other species. [Cont., *op. cit.*, Sep., p. 84-88 (Rec., 3905).] *B: P. M.* (3904)

Chambers, Vactor Tousey. Micro-lepidoptera. (Can. entom., Sep. 1871, v. 3, p. 84-88.)

[Cont. from *op. cit.*, July, p. 54-58 (Rec., 3904).] Characters, food-plants and habits of four species of *lithocolletis*, of which one (*l. virginiella*) is new, with remarks on other species, including *anacampsis robiniella*. [Cont., *op. cit.*, Sep., p. 108-112 (Rec., 3906).] *B: P. M.* (3905)

Chambers, Vactor Tousey. Micro-lepidoptera. (Can. entom., Sep. 1871, v. 3, p. 108-112.)

[Cont. from *op. cit.*, Sep., p. 84-88 (Rec., 3905).] Characters, food-plants and habits of seven species of *lithocolletis*, of which four (*l. nonfasciella*, *l. bethunella*, *l. tritaeniaella*, *l. corylifella* ["*corylisella*"] are new, and *l. aesculisella* and *l. ostryaeella* are new varieties; tabular synopsis of the characters of the larvae of *l. corylifella*, *l. guttifinitella*, *l. aesculisella* and *l. ostryaeella*. [Cont., *op. cit.*, Oct., p. 127-130 (Rec. 3907).] *B: P. M.* (3906)

Chambers, Vactor Tousey. Micro-lepidoptera. (Can. entom., Oct. 1871, v. 3, p. 127-130.)

[Cont. from *op. cit.*, Sep., p. 108-112 (Rec., 3906).] Characters, food-plants and habits of five species of *lithocolletis*, of which three (*l. ambrosiaecella*, *l. celtifoliella*, *l. celtisella*) are new. [Cont., *op. cit.*, Oct., p. 146-149 (Rec., 3908).] *B: P. M.* (3907)

Chambers, Vactor Tousey. Micro-lepidoptera. (Can. entom., Oct. 1871, v. 3, p. 146-149.)

[Cont. from *op. cit.*, Oct., p. 127-130 (Rec., 3907).] Characters, food-plants and habits of four species of *lithocolletis*, of which two (*l. cincinnatiella*, *l. ulmella*) are new. [Cont., *op. cit.*, Nov., p. 161-166 (Rec., 3909).] *B: P. M.* (3908)

Chambers, Vactor Tousey. Micro-lepidoptera. (Can. entom., Nov. 1871, v. 3, p. 161-166.)

[Cont. from *op. cit.*, Oct., p. 146-149 (Rec., 3908).] Characters, food-plants and habits of three species of *lithocolletis*, of which *l. ornatella* is new, with remarks on several others not known in the imago state. [Cont. *op. cit.*, Nov., p. 182-185 (Rec., 3910).] *B: P. M.* (3909)

Chambers, Vactor Tousey. Micro-lepidoptera. (Can. entom., Nov. 1871, v. 3, p. 182-185.)

[Cont. from *op. cit.*, Nov., p. 161-166 (Rec., 3909).] Condensed account of species of *lithocolletis* described by Clemens, Packard and Fitch, but unknown to author; discussion of the number and sequence of broods of several genera of *tineina*. [Cont., *op. cit.*, Dec., p. 205-209 (Rec., 3911).] *B: P. M.* (3910)

Chambers, Vactor Tousey. Micro-lepidoptera. (Can. entom., Dec. 1871, v. 3, p. 205-209.)

[Cont. from *op. cit.*, Nov., p. 182-185 (Rec., 3910).] Describes *leucanthiza? saundersella*, *phyllocnistis vitifoliella* and *ph. ampelopsiella* as new species, and remarks upon the generic characters of *phyllocnistis*, *tischeria* and *cemiostoma*, and upon the North American species of these genera. [Cont., *op. cit.*, Dec., p. 221-224 (Rec., 3912).] *B: P. M.* (3911)

Chambers, Vactor Tousey. Micro-lepidoptera. (Can. entom,, Dec. 1871, v. 3, p. 221-224.)

[Cont. from *op. cit.*, Dec., p. 205-209 (Rec., 3911).] Remarks upon the generic characters of *laverna* and *aspidisca*, and upon the North American species of these genera, including *Lyonetia saccatella;* describes *laverna cephalanthiella* and *aspidisca ella* as new species. [Cont., *op. cit.*, Jan. 1872, v. 4, p. 7-12 (Rec., 3913).] *B: P. M.* (3912)

Chambers, Vactor Tousey. Micro-lepidoptera. (Can. entom., Jan. 1872, v. 4, p. 7-12.)

[Cont. from *op. cit.*, Dec. 1871, v. 3, p. 221-224 (Rec., 3912).] Remarks upon the generic characters of *gracilaria* ["*gracillaria*"], including *parectopa*, *coriscium* and *euspilapteryx;* characters, food-plants and habits of five species of *gracilaria*, of which three (*g. cupatoriella*, *g. plantaginisella*, *g. 12-lineella*) are new. [Cont., *op. cit.*, Feb., p. 25-29.] *B: P. M.* (3913)

Chretien, P. De l'influence du froid sur les chrysalides. (Feuilles des jeunes naturalistes, May 1885, an. 15, p. 95-96.)

General résumé of the researches of W: H: Edwards upon the effect of cold upon the chrysalids of rhopalocera. *G: D.* (3914)

Clarke. Cora H. Description of two interesting houses made by native caddis-fly larvae. (Proc. Bost. soc. nat. hist., 24 May 1882, v. 22, p. 67-71, fig. 1-6.)

Separate, with t.-p. cover. p. 67-71. 24 × 15, 117 × 9.7; fig. 1-6.

Describes and figures the larval cases of a species of *hydropsyche* and one of *plectrocnemia*, found near Boston, Mass., and adds a few notes on the habits of their larvae and pupae. *G: D.* (3915)

Clemens, Brackenridge. Synopsis of families of heterocera. (Proc. Entom. soc. Philad., Mar. 1862, v. 1, p. 173-181.)

Reprint. (CLEMENS, B. The *tineina* of North America . . . Stainton. Lond., 1872. p. 195-206.)

Description of author's and of A. Guenée's methods of denuding wings of lepidoptera; definition of pterological terms; dichotomic synoptical table to discriminate all the families of *lepidoptera heterocera;* directions for using this table. *B: F. M.* (3916)

Clements, James. Description of the *oestrus ovis*, or the botts of sheep. (Amer. mo. mag. and crit. rev. . . . Biglow . . ., Feb. 1818, v. 2, no. 4, p. 249-250, 45 cm.)

Valuable description of larva and imago and method of attack of *oestrus ovis*. *B: P. M.* (3917)

Clifford, J. R. S. The urticating properties of the hairs of *porthesia chrysorrhoea*. (Entomologist, Jan. 1885, v. 18, p. 22-23.)

Notes on the stinging hairs and the urtication produced by them, in certain species of *bombycidae*. *G: D.* (3918)

Cockerell, T. D. A. Scientific nomenclature. (Entomologist, April 1885, v. 18, p. 120.)

The author objects to the extensive use of names of persons in scientific names of animals. *G: D.* (3919)

Cockerell, T. D. A. The urticating hairs of lepidoptera. (Entomologist, Mar. 1885, v. 18, p. 74-75.)

Cocoons of *porthesia similis* which have been exposed to the weather for months, still produce urtication; the author thinks "this militates strongly against the theory of the effects being caused otherwise than by the mechanical properties of the hairs." *G: D.* (3920)

Coleman, Nathan. Notes on the changes in the larvae of *orgyia leucostigma*. (Journ. Bost. zoöl. soc., Oct. 1882, v. 1, p. 39-42.)

Account of observations made on changes of color in the larvae of *orgyia leucostigma*. *R. H.* (3921)

Coleman, Nathan. Notes on the larvae of certain heterocerous lepidoptera. (Journ. Bost. zoöl. soc., July 1882, v. 1, p. 28-29.)

Describes certain of the earlier stages of *carpocapsa pomonella*, *aegeria cucurbitae* and *arctia isabella*. *R. H.* (3922)

Coleman, Nathan. *Papilio cresphontes* at Berlin, Conn. (Journ. Bost. zoöl. soc., Oct. 1882, v. 1, p. 53.)

Records the capture of a number of specimens of *papilio cresphontes* at Berlin, Conn. *R. H.* (3923)

Comber, T: Insects and colour in flowers. (Nature, 19 Nov. 1874, v. 11, p. 47, 13 cm.)

Thinks we cannot, with our present knowledge, decide whether beauty is an "object in nature." *G: D.* (3924)

Comstock, J: H: On the transmission of insects through the U. S. mails. (Amer. entom., Apr. 1880, v. 3, n. s., v. 1, p. 104, 23 cm.)

Statement of the laws in force in United States regarding the transmission of insects by mail; dead specimens, pinned or free, may be mailed if properly packed; live specimens can only be mailed in sealed letters. *B: P. M.* (3925)

Cook, Albert J: Another bee enemy. (Can. entom., Jan. 1879, v. 11, p. 17-20, fig. 1-8.)

Phymata erosa siezes bees and sucks their blood, and can sting quite severely; description of *ph. erosa*, with figures of the entire insect, its proboscis, its antenna, and its anterior and middle leg; predaceous habits, and bibliography of the species. *G: D.* (3926)

Cook, Albert J. Remarks on some insects injurious to vegetation, in Michigan. (7th ann. rept. secr. state board agric. Mich., for 1868, 1868 [1869], p. 163-170.)

Characters of insects; occurrence and habits of, and means against, *doryphora decemlineata*, *cicada septendecim*, *dryocampa senatoria*, *sphinx quinquemaculata*, *carpocapsa pomonella*, *aspidiotus conchiformis*, and the *pemphigus* of *fagus*. *B: P. M.* (3927)

Cooke, E: Naphthaline. (Entomologist, April 1885, v. 18, p. 125-126.)

Notes some ill effects of using impure naphthalin in collections of insects. *G: D.* (3928)

Cooper, Joseph. Letter from Mr. Joseph Cooper to William Russel, esq. on the hessian fly and the early white wheat. (Papers on agric., Mass. soc. for promot. agric., 1799, p. 26-28.)

Cecidomyia destructor first appeared at Cooper's Point, N. J., in 1788; seasons of the insect, whose ravages may be diminished by late sowing of early white wheat. (3929)

Cope, E: Drinkard. On some new and little known myriapoda from the southern Alleghenies. (Trans. Amer. entom. soc., May 1870, v. 3, p. 65-67.)

Describes *petaserpes* n. g. [*polysonidae*] and *p. rosalbus* n. sp.; remarks on the occurrence and habits of several myriapoda in Tennessee and North Carolina, and especially on the physical characters of the defensive secretions of *strongylia* and *sugentia*. *B: P. M.* (3930)

Corning, Erastus, *jr.* Naphthaline. (Entomologist, Oct. 1882, v. 15, p. 240.)

Advocates the use of naphthalin ($C_{10}H_8$) in natural history collections to prevent the ravages of museum pests. *G: D.* (3931)

Couper, W: Entomology. No. 1. (Can. entom., June 1871, v. 3, p. 32-35.)

Rev., in C. V. Riley's "Friendly notes" (*op. cit.*, Sep., p. 117-119).

Advice to beginners in entomology; recommends neatness, patience, the keeping of field note books, and the formation of collections illustrating insect architecture; states that "every species of insect has a peculiar mode of working in its early stages, and there is a kind of non-deviation in the work which a practical eye can trace." *B: P. M.* (3932)

Coverdale, G: Additional notes upon setting lepidoptera unpinned. (Entomologist, July 1885, v. 18, p. 183-188.)

Describes a mode of spreading the wings of lepidoptera and mounting them for the collection, which is especially applicable to microlepidoptera. The editor of the *Entomologist* (J: T. Carrington) appends a note on the method. *G: D.* (3933)

Cox, E: W. Intellect in brutes. (Nature, 31 July 1879, v. 20, p. 315, 29 cm.)

Reprint. (Saturday mag., 6 Dec. 1879 . . .) [not seen.]

Describes actions of ants in carrying home a carcass of a cockroach (*blatta orientalis*), which go to show that the ants have intelligence and means of communication. *G: D.* (3934)

Cramer, A. W. Putnam. A new col ground. (Bull. Brooklyn entom. soc 1883, v. 5, p. 90.)

Record of capture of two specimens of *catoc juga* aboard a vessel on the way to Europe off of Newfoundland. *B: P. J*

Cricket's chirp and the temperature (Nature, 5 Jan. 1882, v. 25, p. 229, (Sci. amer., 11 Mar. 1882, v. 46, p. 1 3, 6 cm.)

Rule for estimating the temperature by the of successive chirps of a cricket [*gryllus*]. *G: J*

Dahl, Friedrich. Ueber den bau u functionen des insectenbeines. Vor mittheilung. (Zool. anzeiger, 21 Ja jahrg. 7, p. 38-41.)

Arrangement of certain muscles of the legs o mode of attachment of the foot of insects to sm faces; brushes, combs, and other apparatus p to the use of the legs of insects in cleaning the *G: J*

DeGrey, T:, *lord Walsingham*. North ican *tortricidae*. (Trans. Entom. soc. 1884, p. 121-147, pl. 4.)

List, with notes, of species of *tortricidae* se thor by H. K. Morrison, including specime Arizona, Mexico, Florida, North Carolina, W and Montana; describes as new: *sciaphila ar oenectra? striata*, *o. distincta*, *platynota stu semiustana*, 7 spp. of *conchylis*, *pseudoconchyli laticapitana*, *aphelia? inquadrana*, *penthina is* 5 spp. of *paedisca*, 3 spp. of *semasia*, and *gra duodecimstriata*, figuring some of these; re- and figures *oenectra irrorea*, and figures *paed anteana*. *G: J*

Dewitz, Herman. Ueber die fortbe der thiere an senkrechten, glatten vermittelst eines secretes. (Archi ges. physiol., 1884, v. 33, p. 440- 7-9.)

Separate, with t.-p. cover. Bonn *Strauss*, 1884. p. 440-481, pl. 7-9, 23.5 t 18 × 10.5.

Abstract, entitled "Wie klettern sekten an glatten wänden?" (Entom richten, May 1884, jahrg. 10, p. 125-

Abstract, entitled "Locomotion mals over smooth vertical su (Journ. Roy. micros. soc., Oct. 18 v. 4, p. 716-718.)

The author states that animals climb vertica surfaces either by means of a fluid which acts larity or is adhesive, or by atmospheric among insects the climbing is accomplished by means of a fluid secreted by glands, ofte tarsus, but the males of *dytiscus* and the *blepharoceridae* have suckers. As is the c certain mites, the tarsal suckers of *dytiscus* used to cling to the female during copulation. of the history of the subject as pertaining to followed by description of mode of observati tarsal hairs in living flies, and account of the of the tarsus and its glands in some insects. secretions to aid locomotion by certain dipter opterous, hymenopterous and hemerobid la springing spiders and by certain mites. *G:*

Dewitz, Hermann. Ueber rudimentäre flügel bei den coleopteren. (Zool. anzeiger. 18 June 1883, jahrg. 6, p. 315-318.)

Separate. 4 p., 24 × 15, t 18 × 11.

The larvae and pupae of *niptus hololeucus*, a wingless beetle, have rudimentary hind wings, showing their descent from winged ancestors. *G: D.* (3940)

Eaton, Alfred Edwin. Did flowers exist during the carboniferous epoch? (Nature, 31 July 1879, v. 20, p. 315, 10 cm.)

Rev. and abstr., entitled "Der angebliche steinkohlenzeit-schmetterling." (Kosmos, Sept. 1879, v. 5, p. 461-462, 18 cm.)

Regards *brcyeria* as an ephemerid of the same group as *palingenia*, and consequently as not a flower-visiting insect. *G: D.* (3941)

Edwards, W: H: Description of a new species of *chrysophanus*. (Trans. Kansas acad. sci. for 1879-80, 1881, v. 7, p. 69-70.)

Separate. [Lawrence, Kans., 1881.] [1] p., 24 × 16.

Describes ♂ and ♀ imagos of *chrysophanus snowi* n. sp., from above timber line on Gray's Peak, Col. *B: P. M.* (3942)

Edwards, W: H: Description of a new species of *melitaea* from Texas. (Can. entom., June 1879, v. 11, p. 117-118.)

Describes *melitaea fulvia* n. sp., from Tex. and Col. *G: D.* (3943)

Edwards, W: H: Description of preparatory stages of *phyciodes nycteis*. (Can. entom., June 1879, v. 11, p. 101-105.)

Describes egg, different stages of the larva, and chrysalis of *phyciodes nycteis*, with notes upon the habits, hibernation, and food-plants of the larva. *G: D.* (3944)

Edwards, W: H: Description of the preparatory stages of *coenonympha gemma*. (Can. entom., Feb. 1879, v. 11, p. 31-35. fig.)

Describes the egg, larva in different stages, and chrysalis of *coenonympha gemma;* figures the larva and its head, and the pupa; discusses the number of molts of different butterfly larvae, the larva of *c. gemma* having only three molts. *G: D.* (3945)

Edwards, W: H: Descriptions of certain species of diurnal lepidoptera found in the United States. (Trans. Amer. entom. soc., Oct. 1867, v. 1. p. 286-288. pl. 5.)

Describes *hesperia pilatka* ♂, from Florida, and *h. nortonii* ♂ ♀ and *h. osyka* ♂ ♀, both from Louisiana, all new species; re-describes and figures *limenitis proserpina* ♂; describes *lycaena violacea* ♀, with notes on its occurrence, and on the occurrence of *hesperia logan, h. nemoris* and *h. rurea; h. nemoris* = *h. samoset; h. rurea* = *h. metacomet*. *B: P. M.* (3946)

Ekelberg, H. J. Om insektfångst ombord på fartyg från främmande land. (Entom. tidskr., 1880, v. 1, p. 101-103.)

Results of examination of vessels and cargoes arriving in Sweden from foreign lands; lists of insects found therein. *B: P. M.* (3947)

Emerton, James H: New England spiders of the family *epeiridae*. (Trans. Conn. acad. arts and sciences, Sep. 1884, v. 6, p. 295-342, pl. 33-40.)

Separate. [New Haven, Conn., Sep. 1884.] half-t.-p. cover + p. 295-342, pl. 33-40, 24 × 15, t 17.5 × 10.4.

Rev. (Science record, 15 Sep. 1884, v 2, p. 255-256. 5 cm.)

Bibliographical (14 titles) and anatomical notes on North American *epeiridae;* the genera *uloborus* and *hyptiotes* transferred to the *cinifionidae;* acknowledgments. Characters and classification of *epeiridae;* descriptions and figures of 51 (6 *epeira*, 3 *singa*, 2 *tetragnatha*, 1 *cyrtarachne* = 12 new) New England species, of 12 (*microepeira, argyroepeira* = 2 new) genera, with notes on localities of capture and on habits; most of the genera are characterized; the new generic name *cyrtarachne* substituted for *cyrtogaster* pre-occupied. *G: D.; B: P. M.* (3948)

Entomological club of the American association for the advancement of science —*Committee on nomenclature, 1875.* [Report, with discussion.] (Can. entom., 1876. v. 8: Sep., p. 179-180; Oct., p. 183-184.) [Rec., 1115.]

Majority report of a committee appointed at Detroit meeting of Entomological club of A. A. A. S., 13 Aug. 1875, to collate and edit the views of leading North American entomologists on questions of entomological nomenclature; rules submitted by the committee, with marginal notes indicating unanimous or divided opinion upon them; provision for conservative action on these rules: discussion of the function of the committee. *B: P. M.* (3949)

Entomological club of the American association for the advancement of science — *President, 1879* (Joseph Albert Lintner). Entomology in America. Address of president at the late meeting of the Entomological club of the A. A. A. S. (Amer. entom., 1880, v. 3, n. s., v. 1: Jan., p. 16-19; Feb., p. 30-34.)

Reprint of author's "Annual address" (Can. entom., Sep. 1879, v. 11, p. 163-175) [Rec., 3862]. *B: P. M.* (3950)

Entomological club of the American association for the advancement of science — *President, 1880* (S: Hubbard Scudder). Annual address before the Entomological club. . . . (Amer. entom., Sep. 1880, v. 3, n. s., v. 1. p. 207-210. 162 cm.)

Annual address of retiring president of Entomological club of A. A. A. S., at Boston meeting, 24 Aug. 1880; brief historical notice of the study of entomology about Boston, Mass.; appeal to entomologists to study the comparative anatomy, embryology, post-embryological development, habits, structure of wings and structure of mouth-parts of insects. [*See* Rec., 2181.] *B: P. M.* (3951)

Fay, H. T. On winter collecting. (Proc. Entom. soc. Philad., May 1862, v. 1. p. 194-198.)

List of more than 130 species of coleoptera collected near Columbus, O., during the winter months, with occasional remarks on the abundance and habitat of certain species. *B: P. M.* (3952)

Schoch, Gustav. *Ephemerella ignita* Poda, eine paedogenetische eintagsfliege. (Mittheil. Schweiz. entom. gesells., Nov. 1884, v. 7, p. 48-50.)

The author, having found the abdomen of a nymph of *ephemerella ignita* filled with eggs, regards the species as paedogenetic. *G: D.* (4042)

Sharp, D: Revision of the species included in the genus *tropisternus*, fam. *hydrophilidae*. (Trans. Entom. soc. Lond., 1883, p. 91-117.)

Discussion of various anatomical characters used in distinguishing genera and species of *hydrophilidae*, and of the validity of the generic name *tropisternus;* of the 31 species, 6 are new, as follows: *t. proximus* (Cuba), *t. parananus* (Parana), *t. breviceps* (Brazil), *t. fulvipalpis* (Mexico), *t. robustus* (Ecuador), and *t. lancifer* (Columbia); creates a new genus, *pleurhomus*, for *t. obscurus* Sharp (Guatemala), and describes a new species, *p. sahlbergi* (Brazil); regards *t. limbalis* Lec. a synonym of *t. dorsalis* Brullé; other notes on synonymy and doubtful species. *G: D.* (4043)

Smith, J: B. Coleopterological notes. (Bull. Brooklyn entom. soc., Aug. 1882, v. 5, p. 25-26.)

Mention of the names of numerous coleoptera found frequenting several species of plants respectively. *B: P. M.* (4044)

Smith, J: B. Collecting *noctuidae* in day time. (Bull. Brooklyn entom. soc., Feb. 1883, v. 5, p. 82.)

Many species of *noctuidae*, especially after midsummer, can be collected by day, and especially on *solidago;* list of some *noctuidae* and *zygaenidae* so found. *B: P. M.* (4045)

Smith, J: B. New *mordellidae* and notes. (Bull. Brooklyn entom. soc., Feb. 1883, v. 5, p. 80-81.)

Describes *mordellistena erratica* and *m. pratensis* from Florida, and *m. tarsalis* from Texas, new species, each from a single specimen; records *m. fusco-atra* from New Jersey and *m. splendens* from Pa., Ill. and Fla. *B: P. M.* (4046)

Snow, Francis Huntington. Additions to the list of Kansas coleoptera in 1881 and 1882. (Trans. Kans. acad. sci., 1881-1882, Topeka, 1883, v. 8, p. 58.)

Adds 49 species of coleoptera to those already known to be found in Kansas; total number of species recorded from Kansas is 1904. *G: D.* (4047)

Snow, Francis Huntington. List of lepidoptera collected near Idaho Springs, Colorado, by the Kansas university scientific expedition for 1879. (Trans. Kansas acad. sci. for 1879-80, 1881, v. 7, p. 61-63.)

List of 168 lepidoptera collected from 26 July to 8 Sep. 1879, near Idaho Springs, Col. (about 2300 metres above sea-level), and of 12 collected at Gray's Peak, Col., (elevation about 4350 metres); the list includes *catocala relicta* and 40 species of *agrotis*. The new species are described in A: R. Grote's "New western *noctuidae*" (*op. cit.*, p. 63-69) [Rec., 3992] and in W: H: Edwards' "Description of a new species of *chrysophanus*" (*op. cit.*, p. 69-70) [Rec., 3942]. *B: P. M.* (4048)

Snow, Francis Huntington. Lists of lepidoptera and coleoptera collected in New Mexico by the Kansas university scientific expeditions of 1881 and 1882. (Trans. Kans. acad. sci., 1881-1882, Topeka, 1883, v. 8, p. 35-45.)

List of 315 species of lepidoptera and 514 species of coleoptera. *G: D.* (4049)

Tepper, F: Collecting on the shores of Long Island Sound. (Bull. Brooklyn entom. soc., Apr. 1883, v. 5, p. 89-90.)

List of *noctuidae* collected near Glencove, L. I.; *pieris protodice* last taken here. *B: P. M.* (4050)

Tepper, F: Description of new moths. (Bull. Brooklyn entom. soc., Jan. 1883, v. 5, p. 65-67, pl.)

Describes *attacus cinctus* and *platysamia polyommata*, new species from southern Arizona, with photo lithotypic figures of these species. *B: P. M.* (4051)

Tepper, F: Habitat of *melitaea colon* and *m. perdiccas*, W. H. Edw. (Bull. Brooklyn entom. soc., Feb. 1883, v. 5, p. 81.)

Statement of localities at which the species named were collected in Washington Territory, though stated in W: H: Edwards' "Description of new species of butterflies" (Papilio, 26 Apr. 1881, v. 1, p. 45, 46) to have been collected in Oregon. *B: P. M.* (4052)

Tyrrell, J. B. Suctoria. (Trans. Ottawa field-nat. club, 1883-1884 [Oct. 1884], v. 2, no. 1, p. 86-90.)

Resumé of the anatomy and life-history of fleas (*pulicidae*), with notes upon a few species. *G: D.* (4053)

Voges, Ernst. Das respirationssystem der scutigeriden. (Zool. anzeiger, 6 Feb. 1882, jahrg. 5, p. 67-69.)

Anatomy of the respiratory system of *scutigera*. *G: D.* (4054)

Websdale, G. Rotheram. The death-watch and its sounds. (Entomologist, Oct. 1884, v. 17, p. 236-237.)

On sonifaction of *atropos pulsatorius* and *anobium tessellatum*. *G: D.* (4055)

Webster, Francis M. A singular ant "cow." (National scientific journ., 1 Aug. 1882, v. 2, p. 101, col. 2, 21 cm.)

Ants attend both larva and imago of *publilia concava*, in order to obtain a fluid exuded by these homoptera. *G: D.* (4056)

Weymer, Gustav. Exotische lepidopteren. 2. (Entom. zeit. . . . Stettin, Jan.-Mar. 1884, v. 45, p. 7-28, pl. 1-2.)

Describes and figures 16 new species of *danaidae* and *heliconidae*, of which *leucothyris paula* is from Veragua, Central America, and the rest from South America; gives synonymical notes on 5 other species. *B: P. M.* (4057)

Gerard, W: R. Notes on the eggs and larvae of an unknown dragon-fly. (Amer. entom., July 1880, v. 3, n. s., v. 1, p. 174-175, 60 cm., fig. 77-80.)

Description and figures of eggs, egg-mass and young larva of *Idiplax* sp.; hatching and first stages of development of the larvae. *B: P. M.* (3967)

Giard, Alfred. De l'influence néfaste des prix de l'Académie. (Bull. scient. du Départem. du nord, Aug.-Sept. 1878, s. 2, année 1, p. 214-219.)

Criticizes certain young French zoologists for neglecting to cite properly earlier naturalists, in the fear of lessening their own chances of winning prizes of the Academy; as an illustration of this neglect the author makes an extract, upon the subject of the balancers of diptera, from A. J. B. Robineau-Desvoidy's "Recherches sur l'organisation vertébrale des crustacés, des arachnides et des insectes" (Paris, 1828), stating that J. Künckel d'Herculais, and — Jousset de Bellesme, in late papers on diptera, have refrained from citing Robineau-Desvoidy's results upon the functions of the balancers. *G: D.* (3968)

Girard, Maurice. Note sur les bruches et, en particulier, sur la bruche du haricot. Extrait du Journal de la Société centrale d'horticulture de France; 3e série, 1, 1879, p. 95-99. Paris, 1879. 4 p., 22×14, t 17×9.5.

Rev. (L'abeille, 1879, v. 17; Nouv. et faits div., no. 24, p. 94.)

On *bruchidae;* especially on *bruchus obtectus*, and on means for destroying it. *G: D.* (3969)

Gissler, Carl Friedrich. Coleopterous larvae of *tenebrionidae* in general. (Bull. Brooklyn entom. soc., June 1878, [v. 1], no. 2, p. 11.)

The larvae of *tenebrionidae* all retraceable to scarcely three typical larval forms, here distinguished. *B: P. M.* (3970)

Gissler, Carl Friedrich. On coleopterous larvae of the family *tenebrionidae*. (Bull. Brooklyn entom. soc., Jul. 1878, [v. 1], no. 3, p. 18-19, fig. 4-5.)

Description of egg and larva of *eleodes gigantea* and of larva of *e dentipes;* figure of larva and structural details of the former, and of pygidium and leg of the latter. *B: P. M.* (3971)

Gissler, Carl Friedrich. On coleopterous larvae of the family of *tenebrionidae*. (Bull. Brooklyn entom. soc., Mch 1879, [v. 1], no. 11, p. 85-88. pl. [1].)

Anatomical and embryological notes on larvae of *tenebrionidae;* pygidial differences of genera; figures of mouth-parts, pygidia and antennae. *B: P. M.* (3972)

Gissler, Carl Friedrich. Die nordamerikanischen verwandten der spanischen fliege. (Deutsch-amer. apotheker-zeitung, 1880. jahrg. 1: 1 July, no. 8, p. 2-3, 45 cm.: 15 July, no. 9, p. 2-3, 35 cm.)

List of "158" species of North American *meloidae*, with indication of the more and most common species, with a view to ascertain the applicability of these species to pharmaceutical purposes. *B: P. M.* (3973)

Gissler, Carl Friedrich. Ueber den ursprung des schild-lack's. (Deutsch-amer. apotheker-zeitung, 1 Dec. 1880, jahrg. 1, no. 18, p. 2, 40 cm.)

Extract, in Germ. tr., from J: M. Stillman's "On the origin of the lac" (Amer. nat., Nov. [23 Oct] 1880, v. 14, p. 782-783) [Rec., 2792, 3555]; notice of erroneous statements in encyclopaedias concerning lac; formation of lac as an insect secretion. *B: P. M.* (3974)

Gray, Arthur F. A complete list of the scientific papers of Thomas Bland, F. G. S., from 1852 to 1883. Salem, 1884. t.-p. cover, 12 p., 24.5×15, t 16×9.8.

Notice. (Amer. nat., Oct. 1884, v. 18, p. 1074.)

List of 72 papers by Bland or by him jointly with W: G. Binney; most of the papers are upon mollusca, a few upon insects. *G: D.* (3975)

Greene, C: A: An essay on insects injurious to vegetation and how to get rid of them. . . . [Harrisburg, Pa., 1883 or 1884.] t.-p. cover, 12 p., 22 × 15, t 19 × 11.2.

[The title contains 163 words!] The first nine pages are devoted to a criticism of the modes of study of noxious insects by entomologists, and especially by the United States Entomological commission and the United States Department of agriculture; the last three pages contain advertisements of "omnipathy," a special mode of treatment by Dr. Greene. *G: D.* (3976)

Gregson, C. S. Natural history nomenclature. (Entomologist, April 1885, v. 18, p. 118-120.)

Numerous citations of technical names of animals derived from names of persons, as a defence of the use of such names in science. *G: D.* (3977)

Grote, A: Radcliffe. [Capture of *audela acronyctoides*.] (Can. entom., Nov. 1879, v. 11, p. 204.)

A male of *audela acronyctoides* captured at light in New York in Aug. 1879; first occurrence of the species in New York. *B: P. M.* (3978)

Grote, A: Radcliffe. Description of *zeugophora reineckei*. (N. A. entom., July 1879, v. 1, p. 5, pl. 1, fig. 6.)

Description and figure of imago of *zeugophora reineckei* n. sp., from *populus*. *B: P. M.* (3979)

Grote, A: Radcliffe. [Distribution of *scoliopteryx libatrix*.] (Can. entom., Oct. 1879, v. 11, p. 195.)

Geographical distribution of *scoliopteryx libatrix*. *B: P. M.* (3980)

Grote, A: Radcliffe. Illustration of microlepidoptera. (N. A. entom., Mch. 1880, v. 1, p. 67-68, pl. 5.)

Figures the neuration and head of *prorasea simalis*, the neuration of *melanomma auricinctaria*, the forewings of *aedis funalis*, *pempelia contatella*, *p. contatella* var. *quinquepunctella*, *crambus exesus*, *c. dissectus*, *c. oregonicus*, *tetralopha diluculella* and *epigraphia crudilella*, and the head of *propexus edonis*, with references to the descriptions of these species; *dakruma turbatella* = *pempelia* (*dakruma*) *grossulariae*. *B: P. M.* (3981)

Grote, A: Radcliffe. [Melanism in *pseudohazis eglanterina*.] (Can. entom., Sep. 1879, v. 11, p. 175.)

Specimens of *pseudohazis eglanterina*, collected on top of Mt. Shasta, were almost entirely black above; this variation supposed to be due to climate.
B: P. M. (3982)

Grote, Augustus Radcliffe. On the moths collected by Prof. Snow in New Mexico. (Trans. Kans. acad. sci., 1881-1882, Topeka, 1883, v. 8, p. 45-57.)

Remarks on geographical distribution of lepidoptera; describes *alypioides* (n. g.) *flavilinguis*, *pygoctenucha* (n. g.) *funerea*, *alexicles* (n. g.) *aspersa*, *agrotis terrealis*, *a. invenusta*, *ammoconia distichoides*, *mamestra vitiula*, *m. mimula*, *homohadena epipaschia*, *copimamestra occidenta*, *trichorthosia* (n. g.) *parallela*, *celiptera bucetum*, *ellopia vitraria*, *eubyja mexicanaria*, *phigalia lixaria*, *lychnosea* (n. g.) *aulalaria*, *chryseudeton avernalis* [5 n. gen., 17 n. sp.]; quotes other descriptions. *G: D.* (3983)

Grote, A: Radcliffe. A new *epigraphia*. (N. A. entom., Jan. 1880, v. 1, p. 53.)

Describes *epigraphia eruditella* n. sp., from Massachusetts. *B: P. M.* (3984)

Grote, A: Radcliffe. A new *eustrotia*. (N. A. entom., Mch. 1880, v. 1, p. 66-67.)

Describes *eustrotia parvimacula* n. sp., from Texas, comparing it with *e. concinnimacula*, of which it probably is a race. *B: P. M.* (3985)

Grote, A: Radcliffe. A new *eustrotia* and *thalpochares*. (N. A. entom., Dec. 1879. v. 1, p. 46-47.)

Describes *eustrotia dividua* n. sp., from Texas, and *thalpochares aetheria* n. sp., from Florida.
B: P. M. (3986)

Grote, A: Radcliffe. A new *halesidota* collected by Professor Snow. (N. A. entom., Dec. 1879, v. 1, p. 46.)

Remarks on the value of the labors of F. H. Snow; describes *halesidota trigona* n. sp., from Colorado.
B: P. M. (3987)

Grote, A: Radcliffe. A new *pinipestis*. (N. A. entom., Mch. 1880, v. 1, p. 67.)

Describes *pinipestis reniculella* n. sp., from northeastern United States. *B: P. M.* (3988)

Grote, A: Radcliffe. New species of moths. (N. A. entom., May 1880, v. 1, p. 91-95.)

Describes *agrotis dolis*, *a. sublatis*, *hadena hulstii*, *gortyna serrata*, *apatela thoracica*, *aedis simulatilis* and *asopia planalis* from Colorado, *agrotis worthingtoni* from Indiana, *agrotis baileyana* from N. Y. and N. H., *agrotis infimatis* from California, and *pseudaglossa scobialis* from New York, all as new species; characters of *anytus sculptus*, now considered a species of *agrotis;* habits of *pseudaglossa lubricalis* and occurence of this species in California. *B: P. M.* (3989)

Grote, A: Radcliffe. A new *tortrix*. (N. A. entom., Oct. 1879. v. 1, p. 29-30.)

Describes *tortrix* (*ptycholoma*) *dissitana* n. sp., from New York. *B: P. M.* (3990)

Grote, A: Radcliffe. New western *noctuidae*. (N. A. entom., 1879, v. 1 : Nov., p. 38-39: Dec., p. 43-46.)

Describes *pyrrhia stilla* n. sp., and 10 new species of *agrotis*, from Colorado; remark on the characters of *agrotis vernilis*. *B: P. M.* (3991)

Grote, A: Radcliffe. New western *noctuidae*. (Trans. Kansas acad. sci., for 1879-80, 1881, v. 7, p. 63-69.)

Describes imagos of *hadena discors* and *gortyna juvenilis* = a new species, and re-describes imagos of *halesidota trigona*, 11 species of *agrotis*, *pyrrhia stilla* and *catocala pura* Hulst, from Idaho Springs, Col.
B: P. M. (3992)

Grote, A: Radcliffe. [Note on *oiketicus abbotti*.] (Can. entom., Nov. 1879, v. 11, p. 201.)

Larva cases of *oiketicus abbotti* (sp. non descr.) found on cotton plant; literary history of the species.
B: P. M. (3993)

Grote, A: Radcliffe. Paris green. (N. A. entom., Sep. 1879, v. 1, p. 22.)

Opposition to the use of Paris green as an insecticide, by reason of its liability to injure domestic animals, including humans. *B: P. M.* (3994)

Grote, A: Radcliffe. Note on the North American genus *hemileuca*. (Trans. Entom. soc. Lond., 1884; Proc., p. 12-13.)

Regards *euleucophaeus tricolor* as belonging to the genus *hemileuca*, but *argyrauges neumoegeni* as sufficiently different structurally from *hemileuca* to be properly in another genus; notes upon the variability of *maia*. *G: D.* (3995)

Grote, A: Radcliffe. [Ravages of *nephopteryx zimmermani*.] (Can. entom., Oct. 1879, v. 11, p. 195.)

Ravages and geographical distribution of *nephopteryx zimmermani;* objections to the use of Paris green as an insecticide; opposing opinions.
B: P. M. (3996)

Grote, A: Radcliffe. Three new coch[illegible]pods. (N. A. entom., Feb. 1880, v. 1. [illegible] 60.)

Describes *monoleuca sulfurea* n. sp., from Flor[illegible] *limacodes flexuosa* and *l. caesonia*, both new spec[illegible] from New York; synonymical note on *limacodes [illegible]mia*. *B: P. M.* (3997)

Guillebeau, A. Ueber die nachtheile, welcher parasitismus einiger oestriden ihr[illegible] wirthen bringt. (Mittheil. Naturfors[illegible] gesells. Bern . . . 1881. 1882. heft 2; Sitzungsber., p. 7-11.)

Upon species of *gastrophilus* which are parasitic the horse, and upon *hypoderma bovis* which attacks cattle, with description of their normal habits as [illegible] sites and of the injuries which they sometimes [illegible] their hosts. *G: D.*

, G. Die arten und gattungen der eizer. hydrachnidenfauna. (Mittheil. rforsch. gesells. Bern . . . 1881, 1882, ; Abhandl., p. 18-83, 4 pl.)

eneral remarks (p. 18-31) precede the systemion of this paper on Swiss *hydrachnidae*, and literature (11 titles): brief outline of the anouth-parts, external glands and openings of nal covering, eyes): discusses the structure of Claparèdes "haftnäpfe," the development, eographical distribution of the *hydrachnidae*. *G: D.* (3999)

ard, Roland. *Cicindela ancocisconen-* Harr., in Vermont. (Journ. Bost. soc., July 1882, v. 1, p. 38.)

ds capture of *cicindela ancocisconensis* at Unchittendon co., Vt. *G: D.* (4000)

ard, Roland. Habits and transforms of *bolitotherus bifurcus*. (Journ. zoöl. soc., July 1882, v. 1, p. 35-36.)

lescription of larva, pupa and imago of *boli- bifurcus;* notes on habits in different stages. *G: D.* (4001)

ard, Roland. *Selenophorus ellipticus* antucket. (Journ. Bost. zoöl. soc., 882, v. 1, p. 10.)

ls occurrence of *selenophorus ellipticus* at Nan- lass. *G: D.* (4002)

ard, Roland. Two rare *carabidae* eastern Massachusetts. (Journ. zoöl. soc., July 1882, v. 1, p. 37-38.)

ls capture of *calosoma wilcoxi* and *badister* i eastern Massachusetts. *G: D.* (4003)

, W: A. Poplar stem gall-lice fed on uirrels. (Amer. entom., Aug. 1880, n. s., v. 1, p. 205-206, 21 cm., fig. 110.)

of *pemphigus populicaulis* on *populus monili-* Ithaca, N. Y., opened by *sciurus hudsonius*, ves the occupants; figure of galls and insects *mphigus*. *B: P. M.* (4004)

G: H: *Harpalus caliginosus*. Fab. details. (Bull. Brooklyn entom. soc., 1883, v. 5, p. 84, fig.)

of under side of imago of *harpalus caligi-* th details of external anatomy numbered and *B: P. M.* (4005)

: H: Vertical vs. horizontal insect . (Amer. nat., May [16 Apr.] 1881, p. 491.)

. of a pamphlet by A. Preudhomme de Borre st arrangement of boxes and cartons of collecsects;" views of the reviewer as to the proper ruction and arrangement of such boxes. *B: P. M.* (4006)

n, G: Vernon. Hermaphrodite lepira. (Entomologist, June 1885, v. 18, -169.)

es a hermaphrodite of *eugonia angularia* and *isia verticillata;* also a probable hermaphro- *nessa gonerilla*. *G: D.* (4007)

Karpelles, Ludwig. Die thierwelt im Leviticus, III buch Moses. (Verhandl. K.-k. zool.-bot. gesells. in Wien, 1885, v. 35; Abh., p. 257-266.)

Pages 262-264 give an explanation of the kinds of insects mentioned in the book of Leviticus, and the meaning and derivation of the Hebrew words used for them in the text of that book. *G: D.* (4008)

Keyserling, Eugen. Neue spinnen aus Amerika. **6.** (Verhandl. K.-k. zool.-bot. gesells. in Wien, jahrg. 1884 [1885], v. 34; Abhandl., p. 489-534, pl. 13.)

Describes 29 new species of American spiders of which 3 are made types of new genera (*wala*, *agobardus*, and *epeiroides*). *G: D.* (4009)

Killing the apple borer. (Springfield [Mass.] d. republican, 2 July 1880, p. 2-3, 8 cm.)

From *Golden rule*. Two remedies for "the appie borer." *G: D.* (4010)

Kohl, Franz Friedrich. Die gattungen und arten der larriden autorum. **1.** (Verhandl. K.-k. zool.-bot. gesells. in Wien, jahrg. 1884 [1885], v. 34; Abhandl., p. 171-268, pl. 8-9.)

Table of the genera of *larridae* (incl. *trypeoxylon* and *nitela*), descriptions of some of the species, and a synonymical catalog of all the species, with notes on their habits and geographical distribution. [Continued under same title, **2.** (*op. cit.*, p. 327-454) (Rec., 4012).] *G: D.* (4011)

Kohl, Franz Friedrich. Die gattungen und arten der larriden autorum. **2.** (Verhandl. K.-k. zool.-bot. gesells. in Wien, jahrg. 1884, [1885], v. 34; Abhandl., p. 327-454, pl. 11-12.)

Continuation of author's paper of the same title, **1.** (*op. cit.*, p. 171-268) [Rec. 4011], on same subject. *G: D.* (4012)

Kreithner, Eduard. Nachricht über massenhaftes auftreten des kohlweisslings in der nähe Wiens. (Verhandl. K.-k. zool.-bot. gesells. in Wien, jahrg. 1884, [1885], v. 34; Sitz.-ber., p. 27-28.)

Great numbers of *pieris brassicae* about Vienna, Austria; the damage they do to cruciferous plants, and how to reduce their numbers by destroying their eggs. *G: D.* (4013)

Löw, Franz. Beiträge zur kenntniss der jugendstadien der psylliden. (Verhandl. K.-k. zool.-bot. gesells. in Wien, jahrg. 1884, [1885], v. 34; Abhandl., p. 143-152.)

Describes the larvae of *amblyrrhina cognata*, *psylla ulmi*, *trioza maura*, *t. scottii* and *t. remota*. Gives a catalog of all the species of *psyllidae* of which earlier stages have been described. *G: D.* (4014)

Machleidt, G. Zwitterbildung eines tagfalters. (Jahreshefte d. Naturw. ver. f. d. fürstentum Lüneburg, 1883-1884, no. 9, p. 131, 1 pl.)

Colored figure with brief description of an apparent hermaphrodite of *epinephele lycaon*. *G: D.* (4015)

MacLeod, Jules. De l'hermaphrodisme de *trombidium* mâle.

Note, appended to author's "La structure de l'intestin antérieur des arachnides" (Bull. Acad. roy. de Belgique, 1884, s. 3, v. 8, p. 377-391) [Rec. 4019].
G: D. (4016)

MacLeod, Jules. Sur l'existence d'une glande coxale chez les phalangides.

Note, appended to author's "La structure de l'intestin antérieur des arachnides" (Bull. Acad. roy. de Belgique, 1884, s. 3, v. 8, p. 377-391) [Rec., 4019].
G: D. (4017)

MacLeod, Jules. Sur la présence d'une glande coxale chez les galéodes. (Bull. Acad. roy. de Belgique, 1884, s. 3, v. 8, p. 655-656.)

The author finds a coxal gland in *galeodes araneoides*, and describes its histological structure.
G: D. (4018)

MacLeod, Jules. La structure de l' intestin antérieur des arachnides. (Bull. Acad. roy. de Belgique, 1884, s. 3, v. 8, p. 377-391, 1 pl.)

Separate. [Bruxelles, 1884.] 20 p., 1 pl., 22 × 14.5, t 15 × 8.7.

Upon the anatomy of the mouth, mouth-parts, oesophagus and glands of the anterior portion of the digestive tract in arachnoidea, based upon comparative studies of acarina, araneida, phalangida, scorpionidea, and pseudoscorpionida. To this paper are appended two notes, one entitled, "Sur l'existence d'une glande coxale chez les phalangides" and the other, "De l'hermaphrodisme de *trombidium* mâle." *G: D.* (4019)

Möschler, Heinrich Bruno. Die Nordamerika und Europa gemeinsam angehörenden lepidopteren. (Verhandl. K.-k. zool.-bot. gesells. in Wien, jahrg. 1884, [1885], v. 34: Abh., p. 273-320.)

Gives a list, with many notes on varieties and distribution, of 243 species of lepidoptera common to both Europe and North America. To this list Alois F. Rogenhofer contributes a "Zusatz" (p. 319-320), in which 9 more species are added. *G: D.* (4020)

Osborne, J. A. Parthenogenesis in a beetle. (Nature, 4 Sept. 1879, v. 20, p. 430, 15 cm.)

Notes parthenogenesis of *gastrophysa raphani*, probably the first case of that form of reproduction noticed among coleoptera. *G: D.* (4021)

Osborne, J. A. Parthenogenesis in coleoptera. (Nature, 30 Sept. 1880, v. 22, p. 509-510, 40 cm.)

Notice. (Amer. nat., Dec. [25 Nov.] 1880, v. 14, p. 899.)

Reprint, entitled "Parthenogenesis in the coleoptera." (Entom. mo. mag., Nov. 1880, v. 17, p. 127-130.)

Abstract, entitled "Parthenogenesis bei käfern." (Entom. nachrichten, 15 Jan. 1881, jahrg. 7, p. 31-32.) [Rec., 3523.]

A few general notes on parthenogenesis of arthropods, followed by a statement of the results of experiments which prove that *gastrophysa raphani* can reproduce parthenogenetically. *G: D.* (4022)

Osten Sacken, C: Robert. Berichtigungen und zusätze zum Verzeichnisse der entomologischen schriften von Camillo Róndani. (Verhandl. K.-k. zool.-bot. gesells. in Wien, jahrg. 1884, [1885], v. 34; Abhandl., p. 117-118.)

Additions to the author's "Verzeichniss der entomologischen schriften von Camillo Róndani" (*op. cit.*, 1881, v. 31, p. 337-344) [Rec., 4026]. *G: D.* (4023)

Osten Sacken, C: Robert. Elenco delle pubblicazioni entomologiche del professor Camillo Rondani. (Bull. Soc. entom. ital., 1885, an. 17, p. 149-162.)

List of the 134 entomological papers or works by Camillo Rondani, extending from 1840 to 1880.
G: D. (4024)

Osten Sacken, C: Robert. Facts concerning the importation or non-importation of diptera into distant countries. (Trans. Entom. soc. Lond., 1884, p. 489-496.)

Discusses the extensive distribution of *eristalis tenax* and how it came into North America; asks why *sarcophaga carnaria* has not reached America, while so many other common European species are found in North America; discusses the mode of ingress of *psilopus pallens* into North America, of *culex* into the Sandwich Islands, and of *syrphus pyrastri* into the western United States and into Chili. *G: D.* (4025)

Osten Sacken, C: Robert. Verzeichniss der entomologischen schriften von Camillo Róndani. Als nachtrag und fortsetzung zu dem betreffenden artikel in H. A. Hagen's Bibliotheca entomologica. (Verhandl. K.-k. zool.-bot. gesells. in Wien, 1881, v. 31; Abhandl., p. 337-344.)

List of Rondani's entomological papers in addition to and correction of that given by Hagen in his Bibliotheca entomologica [Rec. 3306]. The present list carries the number of entomological papers up to 129. *See also* the author's "Berichtigungen und zusätze zum Verzeichnisse der entomologischen schriften von Camillo Róndani" (*op. cit.*, 1884, v. 34; Abh., p. 117-118) [Rec. 4023]. *G: D.* (4026)

Osten Sacken, C: Robert. Verzeichniss der entomologischen schriften von Hermann Löw. Als nachtrag und fortsetzung des betreffenden artikels in H. A. Hagen's Bibliotheca entomologica. (Verhandl. K.-k. zool.-bot. gesells. in Wien, jahrg. 1884, [1885], v. 34: Abhandl., p. 455-464.)

List of H. Loew's papers, in addition to those enumerated by Hagen in his Bibliotheca entomologica [Rec., 3305], bringing the number of Loew's papers up to 222. *G: D.* (4027)

Patton, W: Hampton. Some notes on the classification and synonymy of fig-insects. (Trans. Entom. soc. Lond., 1884: Proc., p. 14-17.)

The author gives reasons why he cannot accept the view of Sidney Smith Saunders that the *agaonidae* belong in the *cynipidae;* gives the characters of the *cynipidae* and of the *chalcididae*, to the latter of which the author believes the family *agaonidae* belongs; characters defining the *agaonidae;* synonymy of some of Francis Walker's descriptions of fig-insects.
G: D. (4028)

Peal, S. E. Sound-producing ants. (Nature, 22 Sept. 1881, v. 24, p. 484, 8 cm.)

Describes synchronous tapping of species of ants, in Assam. *G: D.* (4029)

Peal, S. E. Sounds made by ants. (Nature, 21 Oct. 1880, v. 22, p. 583, 8 cm.)

Notes the sonifaction of two species of ants by means of scraping dry crisp leaves with the horny apex of the abdomen. *G: D.* (4030)

Poulton, E: B. Notes upon, or suggested by the colours, markings, and protective attitudes of certain lepidopterous larvae and pupae, and of a phytophagous hymenopterous larva. (Trans. Entom. soc. Lond., 1884, p. 27-60, pl. 1.)

Discusses the origin of the red markings observed on some larvae of *sphinx* and *smerinthus*, and their value in protecting these larvae; considers the origin of the white stripes in *smerinthus ocellatus* and the use of the remains of the subdorsal white stripe in the last larval stage; regards the replacement of the subdorsal by the oblique white stripes as comparatively recent in larvae of *s. ocellatus;* believes that the variation of the ground color in *s. ocellatus* is phytophagic; discusses the protection sometimes gained by the changes in color of larvae just before pupation; notes some peculiar cases of protective attitudes in larvae of *geometridae* (especially of *ephyra* and *aspilates*); discusses the protective attitude of *notodonta ziczac* as an instance of simulated angularity; remarks upon protective coloration due to internal organs in the larva of *nematus curtispina*; classifies protection by resemblance to surrounding objects into special and general; discusses the significance of larval and pupal dimorphism, and phyletic parallelism in metamorphic species. *G: D.* (4031)

Rogenhofer, Alois Friedrich, *see* Mö-CHLER, H. B. Die Nordamerika und Europa gemeinsam angehörenden lepidopteren [Rec., 4020].

Rondani, Camillo, *see* OSTEN SACKEN, C: R. Elenco delle pubblicazione entomologiche . . . [Rec., 4024].

Rondani, Camillo, *see* OSTEN SACKEN, C: R., Verzeichniss der entomologischen schriften von Camillo Róndani . . . [Rec. 4026].

Saunders, W: The goldsmith beetle: *cotalpa lanigera*. (Can. entom., Feb. 1879, v. 11, p. 21-22, fig. 9-10.)

Popular account of *cotalpa lanigera;* its food-plants, oviposition and other habits; figures of larva and imago. *G: D.* (4032)

Schaitter, Ignaz. [Libellenzüge.] (Verhandl. K.-k. zool.-bot. gesells. in Wien. 1880, v. 30; Sitz.-ber., p. 40.)

Flights of *libellula depressa* and *l. quadrimaculata* in Austria. *G: D.* (4033)

Schaupp, Frank G: Biological notes on, and description of the larva of *calosoma calidum*. Fab. (Bull. Brooklyn entom. soc., Sep. 1882, v. 5, p. 33-34.)

Subject as in title. *B: P. M.* (4034)

Schaupp, Frank G: Collection notes. (Bull. Brooklyn entom. soc., Aug. 1882, v. 5, p. 26.)

Pomphopoea sayi, limenitis arthemis, and *l. ursula* unusually abundant at North Branch, Sullivan co., N. Y., in 1882. *B: P. M.* (4035)

Schaupp, Frank G: Description of the larva of *necrophorus tomentosus*, Web. (Bull. Brooklyn entom. soc., Nov.-Dec. 1881, v. 4, p. 37-38; Jul. 1882, v. 5, pl. 1, fig. 1.)

Description and figures of larva of *necrophorus tomentosus*. *B: P. M.* (4036)

Schaupp, Frank G: Description of the larva of *patrobus longicornis*. (Bull. Brooklyn entom. soc., Mch.-Apr. 1882, v. 4, p. 56; Jul. 1882, v. 5, pl. 1, fig. 2.)

Description and figures of the larva of *patrobus longicornis*. *B: P. M.* (4037)

Schaupp, Frank G: Description of the larva of *silpha americana*. Lin. (Bull. Brooklyn entom. soc., May 1882, v. 5, p. 2; July 1882, pl. 1, fig. 3.)

Description and figures of the larva of *silpha americana*. *B: P. M.* (4038)

Schaupp, Frank G: On the occurrence of *amphicoma*. (Bull. Brooklyn entom. soc., Feb. 1883, v. 5, p. 83.)

Extract from a letter from E. J. Ricksecker, describing the occurence and actions of *amphicoma (dasydera) ursina* on sand dunes near San Francisco, Cal.; notes by author, on the occurrence of *a. (lichnanthe) lupina* on sand at Coney Island, N. Y. *B: P. M.* (4039)

Schaupp, Frank G: Remarks on some coleopterous pupae. (Bull. Brooklyn entom. soc., Jul. 1882, v. 5, p. 18; pl. 1, fig. 4-7.)

Descriptions and figures of pupae of *cicindela repanda, chlaenius laticollis, dicaelus dilatatus* and *galerita janus*. *B: P. M.* (4040)

Schletterer, August. Die hymenopteren-gattung *gasteruption* Latr., *foenus* aut. (Verhandl. K.-k. zool.-bot. gesells. in Wien. 1885, v. 35; Abhs., p. 267-326, pl. 14.)

Gives a description of the genus *gasteruption* Latr. (=*foenus* Fabr.), a description of the European species with complete synonymy, a description of the exotic forms in the collection of the imperial court at Vienna, a catalog of all the species, and a quotation in the original text of the descriptions of all the species unknown to the author. Of American species re-describes *g. occidentale* Cress. (Col.), describes as new species *g. tenuicolle* (Mexico), quotes the original descriptions of *g. barnstoni* Westw. (Huds. Bay), *g. brasiliense* Blanch. (Brazil), *g. guildingii* Westw. (St. Vincent Isl.), *g. incertum* Cress. (Col.), *g. kirbyi* Westw. (Huds. Bay), *g. montanus* Cress. (Col.), *g. perplexum* Cress. (Col.), *g. ruficorne* Gay (Chili), *g. rufipectum* Westw. (St. Vincent Isl.), *g. tarsatorium* Say (Pa.) [and also Cresson's description (Mass.)]; catalogs *g. arca* Coup. [corr.] (Ottawa), and *g. irritator*, Harris (Mass.). *G: D.* (4041)

Schoch, Gustav. *Ephemerella ignita* Poda, eine paedogenetische eintagsfliege. (Mittheil. Schweiz. entom. gesells., Nov. 1884, v. 7, p. 48-50.)

The author, having found the abdomen of a nymph of *ephemerella ignita* filled with eggs, regards the species as paedogenetic. *G: D.* (4042)

Sharp, D: Revision of the species included in the genus *tropisternus*, fam. *hydrophilidae*. (Trans. Entom. soc. Lond., 1883, p. 91-117.)

Discussion of various anatomical characters used in distinguishing genera and species of *hydrophilidae*, and of the validity of the generic name *tropisternus;* of the 33 species, 0 are new, as follows: *t. proximus* (Cuba), *t. paranaanus* (Parana), *t. breviceps* (Brazil), *t. fulvipalpis* (Mexico), *t. robustus* (Ecuador), and *t. lancifer* (Columbia); creates a new genus, *pleurhomus*, for *t. obscurus* Sharp (Guatemala), and describes a new species, *p. sahlbergi* (Brazil); regards *t. limbalis* Lec. a synonym of *t. dorsalis* Brullé; other notes on synonymy and doubtful species. *G: D.* (4043)

Smith, J: B. Coleopterological notes. (Bull. Brooklyn entom. soc., Aug. 1882, v. 5, p. 25-26.)

Mention of the names of numerous coleoptera found frequenting several species of plants respectively. *B: P. M.* (4044)

Smith, J: B. Collecting *noctuidae* in day time. (Bull. Brooklyn entom. soc., Feb. 1883, v. 5, p. 82.)

Many species of *noctuidae*, especially after midsummer, can be collected by day, and especially on *solidago;* list of some *noctuidae* and *zygaenidae* so found. *B: P. M.* (4045)

Smith, J: B. New *mordellidae* and notes. (Bull. Brooklyn entom. soc., Feb. 1883, v. 5, p. 80-81.)

Describes *mordellistena erratica* and *m. pratensis* from Florida, and *m. tarsalis* from Texas, new species, each from a single specimen; records *m. fusco-atra* from New Jersey and *m. splendens* from Pa., Ill. and Fla. *B: P. M.* (4046)

Snow, Francis Huntington. Additions to the list of Kansas coleoptera in 1881 and 1882. (Trans. Kans. acad. sci., 1881-1882, Topeka, 1883, v. 8, p. 58.)

Adds 49 species of coleoptera to those already known to be found in Kansas; total number of species recorded from Kansas is 1904. *G: D.* (4047)

Snow, Francis Huntington. List of lepidoptera. collected near Idaho Springs, Colorado, by the Kansas university scientific expedition for 1879. (Trans. Kansas acad. sci. for 1879-80, 1881, v. 7, p. 61-63.)

List of 168 lepidoptera collected from 26 July to 8 Sep. 1879, near Idaho Springs, Col. (about 2300 metres above sea-level), and of 12 collected at Gray's Peak, Col., (elevation about 4350 metres); the list includes *catocala relicta* and 40 species of *agrotis*. The new species are described in A: R. Grote's "New western *noctuidae*" (*op. cit.*, p. 63-69) [Rec., 3992] and in W: H: Edwards' "Description of a new species of *chrysophanus*" (*op. cit.*, p. 69-70) [Rec., 3942]. *B: P. M.* (4048)

Snow, Francis Huntington. Lists of lepidoptera and coleoptera collected in New Mexico by the Kansas university scientific expeditions of 1881 and 1882. (Trans. Kans. acad. sci., 1881-1882, Topeka, 1883, v. 8, p. 35-45.)

List of 315 species of lepidoptera and 514 species of coleoptera. *G: D.* (4049)

Tepper, F: Collecting on the shores of Long Island Sound. (Bull. Brooklyn entom. soc., Apr. 1883, v. 5, p. 89-90.)

List of *noctuidae* collected near Glencove, L. I.; *pieris protodice* last taken here. *B: P. M.* (4050)

Tepper, F: Description of new moths. (Bull. Brooklyn entom. soc., Jan. 1883, v. 5, p. 65-67, pl.)

Describes *attacus cinctus* and *platysamia polyommata*, new species from southern Arizona, with photo lithotypic figures of these species. *B: P. M.* (4051)

Tepper, F: Habitat of *melitaea colon* and *m. perdiccas*, W. H. Edw. (Bull. Brooklyn entom. soc., Feb. 1883, v. 5, p. 81.)

Statement of localities at which the species named were collected in Washington Territory, though stated in W: H: Edwards' "Description of new species of butterflies" (Papilio, 26 Apr. 1881, v. 1, p. 45, 46) to have been collected in Oregon. *B: P. M.* (4052)

Tyrrell, J. B. Suctoria. (Trans. Ottawa field-nat. club, 1883-1884 [Oct. 1884], v. 2, no. 1, p. 86-90.)

Resumé of the anatomy and life-history of fleas (*pulicidae*), with notes upon a few species. *G: D.* (4053)

Voges, Ernst. Das respirationssystem der scutigeriden. (Zool. anzeiger, 6 Feb. 1882, jahrg. 5, p. 67-69.)

Anatomy of the respiratory system of *scutigera*. *G: D.* (4054)

Websdale, G. Rotheram. The death-watch and its sounds. (Entomologist, Oct. 1884, v. 17, p. 236-237.)

On sonifaction of *atropos pulsatorius* and *anobium tessellatum*. *G: D.* (4055)

Webster, Francis M. A singular ant "cow." (National scientific journ., 1 Aug. 1882, v. 2, p. 101, col. 2, 21 cm.)

Ants attend both larva and imago of *publilia concava*, in order to obtain a fluid exuded by these homoptera. *G: D.* (4056)

Weymer, Gustav. Exotische lepidopteren. 2. (Entom. zeit. . . . Stettin, Jan.-Mar. 1884, v. 45, p. 7-28, pl. 1-2.)

Describes and figures 16 new species of *danaidae* and *heliconidae*, of which *leucothyris panla* is from Veragua, Central America, and the rest from South America; gives synonymical notes on 5 other species. *B: P. M.* (4057)

ENTOMOLOGICAL ITEMS.

THE PROCESS OF SKIN-CASTING IN A LEPIDOPTEROUS LARVA.—The following account of a larva casting its skin may be of interest, and may also throw some light on the curious phenomenon of "moulting," for in many works on entomology we are only told that "the skin breaks at the back near the head, and that the larva walks out of its skin after a due amount of twitching and wriggling." Whilst examining a looper caterpillar, about ½ inch [1 cm.] long and very transparent, under the microscope, I was very much struck with a peculiar internal movement—each separate segment, commencing at the head, elongated within the outer skin whilst the next ones remained in their former state. Each segment in its turn behaved in this curious manner until the last was reached, when the motion was reversed and proceeded toward the head, when it was again reversed. I only saw this process of elongation accomplished three times, although it may have been going on for some time before I captured the caterpillar, which I found in a quiescent state. The whole proceeding appeared as if the larva was gliding within itself, segment after segment, the outer skin remaining stationary as if held by the other segments, whilst the particular one in motion freed itself within. After remaining motionless for a short interval, the skin near the head swelled and burst open at the back; then I became aware of the fact that the curious process of "moulting" was going on before my eyes. Presently out comes the head of the new caterpillar, pushing forward the old one; looking wonderfully clean with its ten shining black eyes on a cream coloured ground. After a short struggle the new, true legs, transparent fleshy limbs, very much resembling those of a newly-hatched spider, appear, pushing off and treading under foot the old ones. The outer skin must have suddenly contracted, and although I did not see the actual process of contracting, I conclude such was the case, for on examining the latter segments, there I found the skin and the old true legs shrivelled up. The larva then, by a series of wild wriggles, endeavored to extricate its new prolegs (false legs), which in a short time it accomplished. Then all is clear, and the larva, which is quite exhausted, coils itself up and literally pants for breath. When it has "got its wind," it wanders off probably in search of the food which it has well earned. I have no doubt that such is the process with all larvae, although the internal movements of most, especially those having thick and opaque skins, cannot be so easily watched as the young and more transparent ones.—Edward Howgate (*The naturalist*, Nov. 1885, no. 124. p. 366).

PROGNOSTICATIONS OF WEATHER BY INSECTS.—The current number (No. 17) of *Die natur* contains an article by Herr Emmerig, of Lauingen, on German bees as storm warners. From numerous observations, the writer advances tentatively the theory that on the approach of thunderstorms, bees, otherwise gentle and harmless, become excited and exceedingly irritable, and will at once attack any one, even their usual attendant, approaching their hives. A succession of instances are given in which the barometer and hygrometer foretold a storm, the bees remaining quiet, and no storm occurred; or the instruments gave no intimation of a storm, but the bees for hours before were irritable, and the storm came. He concludes, therefore, that the conduct of bees is a reliable indication whether a storm is impending over a certain district or not, and that, whatever the appearances, if bees are still, one need not fear a storm. With regard to rain, merely, the barometer and hygrometer are safer guides than bees; not so, however, in the case of a thunderstorm. Finally, the writer trusts that his remarks on this subject may lead to further observation.—*Nature*, 23 April 1885, v. 31, p. 587.

In regard to the prognostications of weather by insects, the following passages from Kirby & Spence's "Introduction to entomology" may be added:—

"Huber says that he has ascertained by a great number of observations that electricity is singularly favourable to the secretion of the substance of which honey is formed by flowers; the bees never collect it in greater abundance, nor is the formation of wax ever more active, than when the wind is in the south, the air humid and warm, and a storm gathering."—v. 4, p. 141.

"But besides receiving notices from the atmosphere, of sounds, and of the approach or proximity of other insects, &c., the antennae are probably the organs by which insects can discover alterations in its state, and foretel by certain prognostics when a change of weather is approaching. Bees possess this faculty to an admirable degree. When engaged in their daily labours, if a shower is approaching, though we can discern no signs of it, they foresee it, and return suddenly to their hives. If they wander far from home, and do not return till late in the evening, it is a prognostic to be depended upon, that the following day will be fine: but if they remain near their habitations, and are seen frequently going and returning, although no other indication of wet should be discoverable, clouds will soon arise and rain come on. Ants also are observed to be excellently gifted in this respect: though they daily bring out their larvae to sun them, they are never overtaken by sudden showers.* Previously to rain, as you well know, numberless insects seek the house; then the *Stomoxys calcitrans*, leaving more ignoble prey, attacks us in our apartments, and interrupts our studies and meditations.† The insects of prey also foresee the appr wet weather, and the access of flies, places of shelter. Then the spider from their lurking-places, and the g beetles in the evening run about our h

Passive antennae, which are usual nished with a terminal or lateral brist plumose and pectinated ones, seem cal for the action of the *electric* and othe dispersed in the atmosphere, which in states and proportions may certainly i the approach of a tempest, or of show a rainy season, and may so affect organs as to enable the insect to make prognostic of any approaching chang we know of no other organ that is so to have this power. I say *electric* because when the atmosphere is in a electrified state, and a tempest is app ing, is the time when insects are t most abundant in the air, especially t the evening; and many species may be taken, which are not at other time met with: but before the storm comes disappear, and you will scarcely see a individual upon the wing. This see indicate that insects are particularly e by electricity.—But upon this head I w make no positive assertion. I only s the probability of the opinion.‡"—v. 253-254.

Dr. H. A. Hagen, in his Bibliotheca mologica [Rec., 3306], cites the foll papers on this subject:—

*Vorzeichen der witterung an e insecten. (Neues Wittenb. woche 1810. p. 226-228.)

Strobel, Pellegrino. Saggio di o zioni fenologiche relative ai cimici de pavese e studii su la flora de essi pred (Atti Soc. ital. sci. nat., 1861, v. 3, p [not seen.]

* Lehmann, M. C. G. De antennis insectorum. Dissertatio posterior . . . , 1800, p. 69—.

† K. & S., v. 1, p. 48, 110.

‡ See, for further arguments, Lehmann, *ubi supr.*, cap. 9.

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CONTENTS:

RTISEMENTS 330
ENTOMOCECIDIA. INTRODUCTION—*Frank Karsch* 331-334
HE RELATIONS OF FUNGI TO GALLS AND TO LARVAE OF CECIDOMYIA
IVING IN GALLS—*Hermann August Hagen* 334
E OF VOLUME FOUR—*Benjamin Pickman Mann* 335
EEDINGS OF SOCIETIES—CAMBRIDGE ENTOMOLOGICAL CLUB . . . 335-338
OGRAPHICAL RECORD OF CONTENTS OF VOLUME FOUR OF PSYCHE, NO.
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MOLOGICAL ITEMS 351-354

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PSYCHE.

THE ENTOMOCECIDIA.

Introduction.

BY FERDINAND ANTON FRANZ KARSCH, BERLIN, GERMANY.

[Translated by B: Pickman Mann, from Entomologische nachrichten, July 1884, jahrg. 10, p. 205-209.]

I propose to offer, under the above title, within the next few years, a list, arranged by families according to a zoological system, of the galls (cecidia) which are produced on plants by insects (entoma), so far as such a list will serve to fill up gaps now existing. The category "plant-galls" is to be taken in the widest sense of the word, i. e., it is to embrace all those modifications which lie outside of the normal methods of development of the plant, and which are presumed to be due to the influence of a definite insect in any stage whatever of its development, from the egg to the imago. Usually only those vegetal formations are designated by the term "galls," which, while they do lie outside of the normal structure of the plant under consideration, yet show forms so definite and so perfect in themselves that they might rather be spoken of as an ornament than as a pathological phenomenon of growth. Of this kind are the well-known puff-balls of our oaks, the bedeguars of our roses, and the spirally twisted petioles of our poplars. But a wider knowledge of such forms, and the observation that anomalies which are far less obvious, and therefore are usually overlooked by the laity, are due to exactly the same formative impulses (such, for instance, as the crumpling of the leaves of trees by the suction of certain *aphididae*), make it necessary to broaden the category "galls," and now every creative reaction of a part of a plant against an irritation which affects it, whether proceeding from an animal or a plant, is conceived of as a gall-making activity, and the resultant structure (cecidium) is termed a *mycocecidium* if a fungus figures as the impulse of the pathological formation, and as a *zoocecidium* if it is due to an animal.

If a coleopterous larva devour the parenchyma of a leaf, or a caterpillar spin together the margins of the leaves in order to make itself a shelter and to prepare itself a closed storehouse for food, the inhabited part of the plant opposes no obstacle to the doings of the animal, and the "miners" are very well to be distinguished from the cecidozoa. Bladder-galls, on the contrary, arise in another way, when the parenchyma of the leaf increases instead of becoming less, and the affected place thickens; and cecidia arise when leaves of trees expand in a direction other than the usual one, solely because of the irrita-

tion resulting from the sucking action of an animal, without being cemented by threads. In this sense some of the insects included among the gall-makers (cecidozoa) by F. Rudow (Uebersicht der gallenbildungen, welche an Tilia, Salix, Populus, Artemisia vorkommen, nebst bemerkungen zu einigen anderen gallen: Zeitschr. für d. ges. naturwissensch., 1875, v. 46, p. 237-287) [p. 269] cannot be considered as such, but *Trachys minuta* Fabr. and *Phyllotoma microcephala* Klug must rather be designated as miners. The resinous galls* also, which are included among the galls by Haimhoffen, in his Beobachtungen über die menge und das vorkommen der pflanzengallen und ihre specielle vertheilung auf die verschiedenen pflanzengattungen und arten (Verh. K.-k. zool.-bot. ges. in Wien, 1858, v. 8, p. 285-294), cannot be placed there without a distinction, if their method of formation presumes no real reaction on the part of the plant against the attacks of the enemy. There belongs, for example, the "manna tihal," which, a saccharine secretion, serves as an abode and for the transformations of some coleopterous larvae, the *Larinus mellificus* Jeckel and *L. maculatus* Falderm., and which occurs not uncommonly in Persia, on species of *Echinops*.†

It is another matter, however, when such formations arise only accessorily, as for instance they are connected with the swelling of the wood in the case of the effect of *Tortrix zebeana* Ratz. On the other hand, since the recently published exhaustive investigations of Graf zu Solms-Laubach and P. Mayer, it can no longer be questioned, as it has been repeatedly in the past, that the caprificators belong to the cecidozoa.

It has been asserted that the cecidozoa preferably or solely attack diseased plants or parts of plants; indeed Ratzeburg goes so far as to set up the view that *tenthredinidae* are purposed to clear away diseased vegetal matter. Every day observation teaches that little weight is to be attached to general statements of this kind; the branches of oaks and elms, while loaded with galls, show forth in autumn in the most luxuriant green!

The list which I have planned is not alone to comprise the palearctic entomocecidia and their producers, but is to take into consideration also those of the rest of the regions, so far as attainable. At the same time the number of plant-galls as yet made known, which are produced by exotic insects, from all the rest of the geographical regions, is a relatively very small one—with the single exception of some of those of the antarctic region, whose entomocecidia have already been partly described in numerous North American periodicals hard to get at.

By the gradual publication of a complete codex of entomocecidia I believe I shall partially supply the need of a codex of zoocecidia in general, which need has long been greatly felt, and has

* Cf. *Kirchner*, Leop. Ant. Die harzgallen der nadelhölzer um Kaplitz. (Lotos, Jan. 1865, v. 6, p. 9-12.)

† Cf. *Hanbury*, Daniel. Note on two insect products from Persia. (Journ. proc. Linn. soc. Lond., 1859, v. 3, p. 173-185, fig.)

constantly become more pressing. The existence of such a need is sufficiently shown by the circumstance that single parts of this codex have already been worked out by illustrious men. Thus, in regard to insects, Julius elder von Bergenstamm and Paul Loew have compiled a "Synopsis cecidomyidarum," Wien, 1876. (Published by the authors. From Verh. K.-k. zool.-bot. ges. in Wein, 1876, v. 26, p. 1-104.)

Among all the animals (cecidozoa) which produce cecidia, the insects form decidedly by far the greater majority. Almost all the orders furnish at least one or another representative, and often from systematically very distant families. The number of species of cecidozoa among the lepidoptera, coleoptera and hemiptera is small; it is far greater among the hymenoptera and diptera; among the rest of the animals, gall-makers are found only among the minute *acarida*, among the microscopic *rotatoria* (living beings usually subordinated to the crustacea), and finally among the *nematoda*. Among the *acarida* it is exclusively the genus *Phytoptus* Duj. (which has been very imperfectly investigated as yet in regard to its species) which gives rise to plant-galls (phytoptocecidia, the *erinea*, *phylleriaceae*, *cephaloneae* of the old botanists) of the most manifold configuration of shape. The plant-galls of Europe, produced by *Phytoptus*, have been worked up rather exhaustively, especially by their most distinguished connoisseur, Friedrich Thomas, in Ohrdruf near Gotha, who has published the results of his investigations in numerous works (namely, in the Zeitschrift f. d. ges. naturwiss... Giebel, and the Nova acta d. Kais. leop.-carol.-deutschen acad. der naturforscher) during a long series of years, and by several articles by Franz Loew in the Verh. K.-k. zool.-bot. ges. in Wien). Of the rotatoria solely *Notommata werneckii* Ehrenb. has been made known as a cecidozoon in algae, species of *Vaucheria*,* and the cecidozoa among the nematoda belong to some dozen species of the two genera of *anguillulidae*, *Tylenchus* Bastian and *Heterodera* Schmidt. Interesting material regarding these two genera of cecidozoa may be found compiled by Karl Mueller: Neue helminthocecidien und deren erzeuger (in Thiel's landwirthscaftliche jahrbücher, 1883, 50 p., 4 pl., and as a Berlin doctorate-dissertation).

A great part of the material with which we have to deal was arranged ten years ago in J. H. Kaltenbach's "Die pflanzenfeinde aus der klasse der insecten," Stuttgart, *J. Hoffmann*, 1874; 8+848 p. Yet this otherwise very useful handbook, besides being very incomplete in a cecidological regard, suffers in the lack of any reference to sources, which is however an indispensable requisite to a critical appreciation of the accumulated material.

In spite of the large number of facts already made known, the study of the entomocecidia and their producers still continues to offer a wide field for new

*cf. *Ehrenberg*. Notommata werneckii. (Mittheil. der Gesells. naturf. freunde zu Berlin, July 1836, p. 30-33.)

investigations, and it is not only of great importance from a purely entomological point of view, inasmuch as the rearing of galls yields insects which belong to the parasites and inquilines, which could not probably be obtained in any other way, but it is so also because it binds together inseparably two great fields of human investigation, botany and entomology. But the study of plant-galls has moreover a deep practical interest in two other directions, in an industrial and agricultural regard. An all-sided consideration of the subject should not leave these sides of it unattended to.

ON THE RELATIONS OF FUNGI TO GALLS AND TO LARVAE OF CECIDOMYIA LIVING IN GALLS.

BY HERMANN AUGUST HAGEN, CAMBRIDGE, MASS.

[Reprint, with slight amendment, of an abstract with the same title, by Hermann August Hagen (Canadian entom., July 1885, v. 17, p. 136-137), of a review, by Friedrich August Wilhelm Thomas (Irmischia, 1885, v. 5, p. 4-), based on a record by Fritz Ludwig (Botan. centralblatt, v. 20, p. 356-) of W: Trelease's "Notes on the relations of two cecidomyians to fungi" (Psyche, Aug-Sep. 1884, v. 4, p. 195-200), Trelease's paper not having been seen by Thomas.]

Larvae of *Cecidomyia* living in the spore-layers of *uredineae* are also found in Thuringia, Germany. In fact the discovery of the community in the same layer of two otherwise very different parasites is at first somewhat wonderful and startling. The right explanation will be a double symbiosis of a phanerogamous plant and a fungus, and of a fungus and an entomozoon. Years ago I received from Gotha such larvae out of the rust-fungus of *Rosa*. A similar manner of living is known in Germany for *Diplosis coniophaga* Winnertz and for D. *caeomatis* Winn. Their larvae were found by F. Loew in the rust-fungus of several plants (cf. Verh. Zool.-bot. ges. Wien, 1874, p. 155-). I am able to add two new facts. I found larvae of *Cecidomyia* on *Vaccinium uliginosum* in the spore-layers of *Thecospora myrtillina* Karsten (*Melampsora vaccinii* Alb. et Schn.), on the Beerberg in the Thueringerwald. The other one was sent to me by Dr. E. Levier, from Florence, Italy. The leaves of *Tanacetum balsamita* L. (Erba di Santa Maria) had, in the *Puccinia tanaceti balsamitae* D C., many small red larvae of *Cecidomyia*. I am not of opinion that this guard is of prominent advantage for the plant. The enormous numbers of the spores of the rust-fungus will scarcely be diminished by these larvae to any extent, that the guard may be considered to be a practical advantage for the plant.

The second point of interest in Mr. Trelease's paper is that the larvae open the way for the fungus in the plants. I may state as an analogous fact, that here the pustulae and pocks on the leaves of *pomaceae*, made by *Phytoptus*, are not rarely filled by fungi, especially by the carbonized ones. The last plant I received by the late Alex. Braun, in 1877, from Blankenburg, Harz, was a leaf of *Sorbus aucuparia*, with fungus immigrated in the galls of the mites.

PSYCHE.

CAMBRIDGE, MASS., OCT.-DEC. 1885.

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CLOSE OF VOLUME FOUR.

For two years past, reasons personal to the Managing editor have prevented the giving of that attention to the issue of PSYCHE which otherwise should have been expected. The concluding numeros of volume four appear, therefore, two years in arrears. Care has been taken, however, that no fault of anachronism should be committed in preparing the numeros for publication.

The form of the Systematic index adopted in volume two, and more perfectly elaborated in volume three, is regarded as of such excellence in its features of general utility and extensibility, that it has been adhered to carefully in this volume. So far as seemed to be practicable, every subject treated of in this volume has been included in the Systematic index under its appropriate designation, with references to the paragraphs of the Bibliographical record.

The Alphabetic index, as in previous volumes, contains references to every technical name of a genus or species of animals mentioned by such name in the volume, with references to the pages.

The volume is committed to the custody of the subscribers and the entomological public with the sincere hope that it may be found of permanent value.

B: Pickman Mann.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

9 JAN. 1885.—The 107th meeting of the club was held at 61 Sacramento St., Cambridge, 9 Jan. 1885. In the absence of the president, Mr. R. Hayward was chosen chairman. On account of the lack of a quorum the business of the annual meeting could not be transacted, and consequently the reports of the officers were deferred until the next meeting.

Mrs. A. K. Dimmock showed specimens of a hymenopterous parasite, probably one of the pteromalids, from the eggs of *Smerinthus excaecatus;* the egg from which the specimens shown had been reared contained over thirty of these minute parasites. [See PSYCHE, Apr.-June 1885, v. 4, p. 282.]

Dr. G: Dimmock exhibited his collection of North American *cicindelidae*, and made some remarks upon the species and their distribution.

13 FEB. 1885. — The 108th meeting was held at 19 Brattle St., Cambridge, 13 Feb. 1885, the president, Mr. S: H. Scudder, in the chair. The annual address of the retiring president was delivered. The annual reports of the secretary and of the treasurer were read, and the secretary made a special report upon the condition of the library. [Abstracts of these reports, except the last, are appended to the report of this meeting. The address of the retiring president is published in PSYCHE, Jan.-Mar. 1885, v. 4, p. 245-250.] The president's address gave rise to much discussion of fossil insects, participated in by all the persons present.

Dr. G: Dimmock stated that *Heterodon platyrhinus*, the so-called "hog-nose snake," eats *Caloptenus femur-rubrum*, fragments of these insects having been found abundant in the excrement of one of these snakes taken in northern Connecticut last fall. The popular name of this species of snake in western New England is "puff-adder" or "flat-headed adder."

Dr. G: Dimmock showed a box of fine

borings which had been sent to him from Springfield, Mass., with an inquiry as to what produced them. They had been found in a house, deposited in dark places beneath furniture, in large masses. Upon examination of the debris, empty cocoons and pupal skins were abundant, which under the microscope were readily seen to be those of some species of ant, probably *Formica pennsylvanica*, which has been known previously to attack woodwork of buildings.

Dr. G: Dimmock showed a specimen of *Cermatia* that had been taken in an office in Boston, Mass.

Abstract of Secretary's Report, 13 Feb. '85. By G: Dimmock.

The present is the 107th meeting of the Club. Since the last annual (or 98th) meeting, held 12 Jan. 1884, four active members have been elected, seven have withdrawn from membership, and two have forfeited their membership by continuous neglect to pay the annual fees. The club has continued its policy of electing no new associate members. Mr. F. G. Sanborn, an associate member, has died during the year. An obituary notice of him was published in PSYCHE, Aug.-Sep. 1884, v. 4, p. 205. The number of active members is now twenty-seven, and the number of associate members forty-nine. During the year 1884 the club held nine meetings, with an average attendance of four persons. Valuable and interesting communications were presented at each meeting. The Club's publication, PSYCHE, has steadily gained favor, and the list of exchanges with scientific societies and valuable periodicals has increased, thus bringing the club prominently before the entomologists of the world. The wide distribution of the membership of the Club, while adding to its importance, has not been compatible with large personal attendance at the meetings. The advantages of larger attendance show the advisability of increasing the number of active members, who will be able to come to the meetings in person.

Abstract of Treasurer's Report, 13 By B: Pickman Mann.

Open accounts have been kept se with each volume of PSYCHE, or the which each corresponds. The acc volume one shows a deficit of $19. for volume two, $239.89; and that years 1880 to 1882, inclusive, a bal hand of $34.59. No further expe will be incurred on these accounts, a for volumes one and two will be m ceipts come in from the sale of c from other sources. Expenditures rent receipts on account of volume continue. The estimated deficit on count is at least $245.00. Especi have been made to determine what d to the Club, for subscriptions, may sidered good for collection, and the of PSYCHE has been discontinued t sons unreasonably in arrears. The of the permanent publication fund to $270.39. [The Treasurer's re duly audited and approved.]

13 MARCH 1885.—The 109th mee held at 61 Sacramento St., Camb March 1885. In the absence of the p Mr. T. W: Harris was chosen chair

The secretary stated that Mr. J: of Chateauguay Basin, P. Q., Can withdrawn from membership, by let 2 March 1885.

Dr. G: Dimmock showed some m ical slides to illustrate the structu different kinds of stigmata in insects

10 APRIL 1885.—The 110th mee held at 19 Brattle St., Cambridge, 1885, the president, Mr. S: H. Sc the chair.

Mr. R. Hayward spoke of a trip proposed to take to southern Col company with Mr. F: C. Bowditch, ing summer.

Mr. S: H. Scudder called attentic tain peculiarities of the venation of t of fossil cockroaches, and made s parisons of the tertiary neuroptera

and North America. This was followed by a general discussion of fossil insects.

8 MAY 1885.—The 111th meeting was held at 19 Brattle St., Cambridge, 8 May 1885, the president, Mr. S: H. Scudder, in the chair.

Mr. S: H. Scudder read some extracts concerning mosquitoes and their abundance, from notes which he had made in 1860 while travelling about Lake Winnipeg and upon the Saskatchewan River. Some discussion followed, upon mosquitoes and other dipterous pests of similar habits.

Mr. S: H. Scudder announced the death of Dr. Hendrik Weyenbergh, well known as a naturalist and entomological writer from Holland, who had chosen the Argentine Republic as a field of labor. He died while upon a visit to his native country.

Dr. G: Dimmock explained a method which he had devised for advantageously utilizing sale-catalogs of books in preparing subject bibliographies, thereby saving much writing.

12 JUNE 1885. — The 112th meeting was held at 19 Brattle St., Cambridge, 12 June 85. the president, Mr. S: H. Scudder, in the chair.

Mr. R. Hayward read a paper upon the distribution of insects in the White Mountains of New Hampshire, in which he called attention to the existence of four tolerably distinct faunae in these mountains. The first, which he called alpine, is restricted to the summits of the higher mountains; the second, which he termed sub-alpine, is confined to the neighborhood of the timber-line; the third occupies the greater part of the country below, and is the ordinary fauna of northern New England; while the fourth is confined to the immediate vicinity of the larger river-bottoms, and is essentially identical with that of eastern Massachusetts. Mr. Hayward's paper led to considerable discussion.

Dr. G: Dimmock described the life-history of *Sphaerularia bombi*, a nematod which is parasitic in humble-bees (*Bombus*), as it has been elucidated by Dufour, Lubbock, Schneider, and Leuckart. Specimens of *S. bombi* were shown; these were taken 10 June 1885, in Cambridge, Mass., by Dr. Dimmock, who believed this to be the first record of their occurrence in America. [See *Amer. nat.*, Jan. 1886, v. 20, p. 73-75.] A brief discussion upon *Sphaerularia*, and upon other subjects, followed.

9 OCT. 1885.—The 113th meeting was held at 61 Sacramento St., Cambridge, 9 Oct. 1885, the president, Mr. S: H. Scudder, in the chair.

Mr. E. F. Ladd, of the N. Y. Experimental station at Geneva, N. Y., communicated, through Mr. B: P. Mann, some observations made by him in the fall of 1884, on the life-habits of *Gelechia cerealella*, which was found to have completely infested the collection of corn in the museum of the station. Hundreds of moths emerged daily, and it became necessary to burn much of the collection while the remainder was packed in boxes and treated to bisulphide of carbon [CS_2]. An examination seems to show that the larvae feed only upon the deposit of starchy matter in the kernel. Larvae were not found in the varieties of sweet corn, in which the starch is distributed throughout the kernel, but they were found, frequently two and occasionally three in a kernel, in the flint corn, in which the starch is deposited in a mass. In pairing, the moths remained together 75 minutes. One moth laid thirty-six eggs, in two patches of 17 and 19, which hatched in seven days, from 2 to 9 November. The eggs were at first milky white, showing an orange tint at the end of twenty-four hours, and gradually becoming deep orange at the end of thirty-six hours. They were laid, on the bottom of a dish, in threes, touching at the ends.

Dr. G: Dimmock described the method adopted by him in rearing *coccinellidae*, and gave a brief account of the life-history and habits of these insects.

Dr. G: Dimmock noted the excessive abundance of a species of *aphididae* on a few maples on North Avenue in Cambridge. So

abundant were these insects that, especially under one tree, the drops of their sugary secretion made the sidewalk beneath constantly appear as if there had just been a light shower. On account of this shower of sugary material the upper sides of the leaves of the trees had the appearance of having been varnished.

Mr. S: H. Scudder reviewed C: Brongniart's Fossil insects of the primary formations, and showed the proof-sheets of the first half of his contribution to Zittel's Handbook of paleontology. The portion, of which proofs were shown, treated of the myriopoda, the arachnida, and part of the insecta, and was abundantly illustrated.

13 Nov. 1885.—The 114th meeting was held at 61 Sacramento St., Cambridge, 13 Nov. 1885.

Dr. G: Dimmock exhibited a collection of bred *coccinellidae*, among which were many varieties bred from a single pair of *Coccinella novemnotata*.

Mr. R. Hayward showed a few specimens of several coleoptera collected by him in southwestern Colorado during the past summer. Among them were *Amphizoa insolens* and a specimen of *Nebria trifaria*. The *Nebria* showed a curious monstrosity, the tarsi of the right anterior leg being trifurcated. In all other respects it was a normal specimen.

Mr. F. S. Child spoke of a specimen of *Argynnis idalia* which he had taken in Barnstable co., Mass., exhibiting remarkable colorational variation. He also mentioned the occurrence, in the autumn of 1883, of *Euptoieta claudia* at Magnolia, Mass.

11 Dec. 1885.—The 115th meeting was held at 19 Brattle St., Cambridge, 11 Dec. 1885.

On motion of R. Hayward a vote of thanks was tendered unanimously to Mr. S: H. Scudder for the use of the office of *Science* for club meetings during the past two years.

Mr. S: H. Scudder reviewed a recently published paper by Prof. Felix Plateau, entitled "Recherches expérimentales sur la vision chez les insectes" (Bull. Acad. roy. Belgique, 1885, ser. 3, v. 10). The chief object of Prof. Plateau's researches was to discover if insects could distinguish the shape of objects.

Mr. S: H. Scudder made some remarks upon the cockroaches (*blattariae*) of the mesozoic period, and exhibited six chromolithographic plates of New England butterflies. The plates gave rise to considerable discussion on different species of New England butterflies.

Mr. P. S. Abbot noted the capture of *Euptoieta claudia* and *Junonia coenia* at Old Orchard Beach, Maine, in 1882.

Mr. B: P. Mann communicated (through the secretary) two notes accompanied by specimens. The first was concerning a digger-wasp (*Stizus*) and a cicada (*Cicada*): "In regard to the cicada and wasp there is nothing new to say. They were caught in the house, the wasp bringing the cicada in its legs as *Stizus* is known to do. The cicada seemed to be dead when picked up from the floor where the wasp had dropped it upon finding itself hemmed in by the walls and window panes." The other communication was concerning a butterfly, *Eudamus tityrus*, and will be published in PSYCHE.

Dr. G: Dimmock showed a large larva of some species of *oestridae* (? *Cuterebra emasculator*), which had been sent to him by Mr. Leroy H. Sykes, of Suffield, Conn. This larva was taken by Mr. Sykes, about 20 Sept. 1884, from beneath the skin of a chip-squirrel (*Tamias striatus*) just at the right of the median ventral line, near the umbilicus. Mr. Sykes thinks the squirrel was a castrate.

Dr. G: Dimmock explained an apparatus by which he was enabled to rear insects in gases of different kinds or in determinate proportions of gases and air.

Dr. G: Dimmock described the way in which the red mites that were so abundant about Cambridge this year produced the fine, light colored lines upon leaves of clover, grass and other plants. Leaves which had been marked by these mites were shown.

Dr. G: Dimmock mentioned certain habits of *Corixa* and *Notonecta*.

BIBLIOGRAPHICAL RECORD OF CONTENTS OF VOLUME FOUR OF PSYCHE.

Academy of natural sciences of Philadelphia. (Psyche, Mch.-Apr. 1883, v. 4, p. 32, 17 cm.)

Abstract of entomological communications made at meetings of Academy, etc., from 8 Aug. 1882 to 23 Jan. 1883, compiled from "Proceedings of the Philadelphia academy of sciences [25 Jul. 1882–6 Feb. 1883]" (Amer. nat., Apr. 1883, v. 17, p. 462-466). *B: P. M.* (4058)

Advertisements. (Psyche, 1883-1885, v. 4, p. 2, 22, 42, 62, 82, 102, 122, 142, 154, 166, 178, 194, 214, 238, 270, 302, 330.)

For further record, see names of respective advertisers. *B: P. M.* (4059)

American agriculturist. (Psyche, 1884-1885, v. 4, p. 194, 214, 238, 270, 302, *each* 5 cm.)

Advertisement. *B: P. M.* (4060)

[**Anal** appendages of lepidoptera.] (Psyche, May-June 1883, v. 4, p. 59, 8 cm.)

References to numerous accounts of the discovery of anal appendages in lepidoptera. *B: P. M.* (4061)

Anatomy of *macrotoma plumbea*. (Psyche, Oct.-Dec. 1885, v. 4, p. 354, 13 cm.)

Translation, from *Entom. nachrichten*, Jul. 1885, v. [illegible] p. 221-222, of abstract of A. Sommer's "Ueber [illegible] *macrotoma plumbea*. Beiträge zur anatomie der [illegible] duriden" (Zeitschr. für wiss. zool., 1885, v. 41, p. [illegible] 3-718); histology of egg and of ventral tube; frequent [illegible] olting of imago; occurrence of parasites; synonymy. *B: P. M.* (4062)

[**Anderson**, Joseph, *jr.*] Posture of newly emerged butterflies. (Psyche, Oct.-Dec. 1885, v. 4, p. 352, 7 cm.)

Notice of Joseph Anderson, jr.'s "Habits of *vanessidae* on emergence" (Entomologist, Sept. 1885, v. 18, p. 241-242), and of other papers by him. *B: P. M.* (4063)

Angus, James. Protective change of color in a spider. (Psyche, Jan.-Feb. 1883, v. 4, p. 19-20, 7 cm.)

Reprint from *American naturalist*, Dec. 1882, v. 16, p. 1010; a white spider, placed on a yellow flower, became yellow; capture of insects by such a spider. *B: P. M.* (4064)

Aphis nectar and honey. (Psyche, Apr.-June 1885, v. 4, p. 300, 10 cm.)

Reprint of "[Nectar secretion from aphides]" (Science, 23 Jan. 1885, v. 5, p. 82); abundance and quality of nectar secreted by *aphididae;* production of honey from this nectar by *apis mellifica*. *B: P. M.* (4065)

[**Apgar**, Austin C.] [Naphthalin vs. *anthrenus.*] (Psyche, Oct.-Dec. 1884, v. 4, p. 234, 5 cm.)

Notice, extracted from *Science*, 21 Nov. 1884, v. 4, Bulletin, p. 5, of communication made by A. C. Apgar, 11 Nov. 1884, to Trenton natural history society; resistance of *anthrenus scrophulariae* to the effects of vapor of naphthalin. *B: P. M.* (4066)

[**Aquatic** coleoptera living in poisonous solutions.] (Amer. nat., Aug. 1883, v. 17, p. 903-904.) (Psyche, Jul.-Aug. 1883, v. 4, p. 79, 7 cm.)

Survival of aquatic coleoptera for long periods in aqueous solutions of curare and strychnine. *B: P. M.* (4067)

[**Aubert**, —, *and* **Dubois**, Raph.] [Luminosity of *pyrophorus.*] (Science, 28 Nov. 1884, v. 4, p. 505.) (Psyche, Oct.-Dec. 1884, v. 4, p. 234, 4 cm.)

Notice of Aubert and R. Dubois' "Sur les propriétés de la lumière des pyrophores" (Compt.-rend. Acad. sci. [Paris], 15 Sep. 1884, v. 99, p. 477-479); character of spectrum of light emitted by *pyrophorus*. *B: P. M.* (4068)

[**Audolent**, P.] Tenacity of life in *calliphora vomitoria*. (Psyche, Oct.-Dec. 1885, v. 4, p. 351, 4 cm.)

Larvae of *calliphora vomitoria* survived for two days under water, and pupated there. *B: P. M.* (4069)

[**Aurivillius**, Christopher.] Lycaenid larvae in ants' nests. (Psyche, Apr.-June 1885, v. 4. p. 299-300, 10 cm.)

Notice translated from *Entomologisk tidskrift*, 1884, p. 227, of communication made by C. Aurivillius to Entomologisk förening i Stockholm, 1 Oct. 1884. *B: P. M.* (4070)

Barnard, W: Stebbins. Treatment processes against *phylloxera vitifoliae*. (Psyche, Mch. 1884, v. 3, p. 143-144, 65 cm.)

Remarks upon the efficacy of the nether-insertion process devised by the writer as a means against *phylloxera vitifoliae* and other subterranean insects, and upon the use of petroleum emulsions, also devised by the writer, as a means against noxious insects in general. *B: P. M.* (4071)

Barrett, C: Golding. Effect of cyanide upon colour. (Psyche, Aug.-Sep. 1884, v. 4, p. 204, 9 cm.)

Reprint of author's "Effect of cyanide upon colour" (Entom. mo. mag., June 1884, v. 21, p. 23). *B: P. M.* (4072)

Biological society of Washington. (Psyche, Jan.-Feb. 1884, v. 4, p. 133-134, 39 cm.)

Partial abstract of communications made at meetings of Biological society of Washington, 14 Dec. and 28 Dec. 1883. *B: P. M.* (4073)

[**Books** on spiders.] (Science, 23 Mch. 1883, v. 1, p. 207.) (Psyche, Mch.-Apr. 1883, v. 4, p. 39, 2 cm.)

Announcement of forthcoming works on spiders by H: C. McCook. *B: P. M.* (4074)

Brauer, Friedrich. The larvae of *oestridae*. (Psyche, Jul.-Sep. 1885, v. 4, p. 305-310, 185 cm.)

Translation, by B: P. Mann, of portion of F. Brauer's "Monographie der oestriden," Wien, 1863, p. 35-40, treating generally of the structural characters, molts and life-habits of larvae of *oestridae*, and of the affinities of the genera. *B: P. M.* (4075)

[**Brongniart**, C:] Fossil *thysanura*. (Psyche, Oct.-Dec. 1885, v. 4, p. 353, 15 cm.)

Translation of C: Brongniart's "[*Dasyleptus lucasi*, sp. n. foss.]" (Bull. Soc. entom. France, 1885, Bull. d. séances, p. 101-102); description of fossil *thysanura* (*dasyleptus lucasi*) occurring in the carboniferous schists of Commentry. *B: P. M.* (4076)

Bullettino del naturalista collectore. (Psyche, 1884, v. 4, p. 142, 154, 166, 170, 194, *each* 3 cm.)

Advertisement. *B: P. M.* (4077)

Cambridge entomological club. (Psyche, Jan.-Feb. 1883, v. 4, p. 13-14, 59 cm.)

Minutes of annual and monthly meeting of Cambridge entomological club, 12 Jan. 1883, and of monthly meeting, 9 Feb. 1883 [by the secretary (G: Dimmock)]; election of officers for 1883; election of members; arrangements for publication of volume four of PSYCHE; abstract of communications made. *B: P. M.* (4078)

Cambridge entomological club. (Psyche, May-June 1883, v. 4, p. 54, 8 cm.)

Minutes of monthly meeting of Cambridge entomological club, 9 March 1883 [by the secretary (G: Dimmock)]; abstract of communications made. *B: P. M.* (4079)

Cambridge entomological club. (Psyche, Nov.-Dec. 1883, v. 4, p. 116, 10 cm.)

Minutes of monthly meetings of Cambridge entomological club, 13 Apr. 1883 [by the secretary (G: Dimmock)]; abstract of communications made. *B: P. M.* (4080)

Cambridge entomological club. (Psyche, Jan.-Feb. 1884, v. 4, p. 133, 20 cm.)

Minutes of monthly meeting of Cambridge entomological club, 11 May 1883 [by the secretary (G: Dimmock)]; abstract of communications made. *B: P. M.* (4081)

Cambridge entomological club. (Psyche, Mch. 1884, v. 4, p. 147, 14 cm.)

Minutes of monthly meeting of Cambridge entomological club, 8 June 1883 [by the secretary (G: Dimmock)]; abstract of communications made. *B: P. M.* (4082)

Cambridge entomological club. (Psyche' Apr. 1884, v. 4, p. 160, 27 cm.)

Minutes of monthly meeting of Cambridge entomological club, 12 Oct. and 9 Nov. and in part of monthly meeting, 14 Dec. 1883 [by the secretary (G: Dimmock)]; withdrawal of members; abstract of communications made. *B: P. M.* (4083)

Cambridge entomological club. (Psyche, May 1884. v. 4, p. 170, 27 cm.)

Minutes of monthly meeting of Cambridge entomological club, 14 Dec. 1883 (concluded), and in part of annual and monthly meeting, 11 Jan. 1884 [by the secretary (G: Dimmock)]; abstract of communication made; election of officers for 1884; election and withdrawal of members. *B: P. M.* (4084)

Cambridge entomological club. (Psyche Jun.-Jul. 1884, v. 4, p. 186, 34 cm.)

Minutes of annual and monthly meeting of Cambridge entomological club, 11 Jan. 1884 (concluded), and of monthly meeting, 8 Feb. 1884 [by the secretary (G: Dimmock)]; abstract of annual reports for 1883, and of communications made; acceptance and withdrawal of members. *B: P. M.* (4085)

Cambridge entomological club. (Psyche, Oct.-Dec. 1884, v. 4, p. 224-226, 70 cm.)

Minutes of monthly meetings of Cambridge entomological club, March-June and Oct.-Dec. 1884 [by the secretary (G: Dimmock)]; withdrawals and death of members; abstract of communications made. *B: P. M.* (4086)

Cambridge entomological club. (Psyche, Oct.-Dec. 1885, v. 4, p. 335-338, 116 cm.)

Minutes of annual and monthly meeting of Cambridge entomological club, 5 Jan. 1885, and of monthly meetings, Feb.-June and Oct.-Dec. 1885 [by the secretary (G: Dimmock)]; abstract of secretary's (G: Dimmock) and treasurer's (B: P. Mann) reports for 1884, and of communications made; withdrawal of a member; vote of thanks to S: H. Scudder for the use of the office of *Science* for club meetings. *B: P. M.* (4087)

[**Carbon** disulphide poisonous.] (Psyche Apr. 1884, v. 4, p. 163, 4 cm.)

Translation, from *Deutsch-amerikanische apotheker zeitung*, 15 Feb. 1884, v. 4, p. 736, of statement that the continued breathing of the vapor of carbon disulphid [CS_2] produces mental derangement. *B: P. M.* (4088)

[**Carlet**, Gaston.] [Poison-glands of hymenoptera.] (Amer. nat., Dec. 1884, 18, p. 1270.) (Psyche, Oct.-Dec. 1885, v. 4, p. 235, 7 cm.)

Abstract of G. Carlet's "Sur le venin des hyménoptères" . . . (Compt.-rend. Acad. sci. [Paris], 23 Jun 1884, v. 98, p. 1550-1551) [Rec., 3685]. *B: P. M.* (4089)

[**Caterpillars** in Sweden.] (Nature, 5 J 1883, v. 28, p. 234.) (Psyche, Jul.-A 1883, v. 4, p. 79, 4 cm.)

Occurrence of unknown injurious lepidopter larva in several parts of Sweden, in 1883. *B: P. M.* (4090)

Chambers, Vactor Tousey. The classification of the *tineidae*. (Psyche, Jul.-Aug. 1883, v. 4, p. 71-74, 109 cm.)

Comments upon remarks made in A: R. Grote's "A brief essay on classification of the heterocera" (Papilio, Feb. 1883, v. 3, p. 35-38); *anaphora* undoubtedly a tineid, even in a restricted sense, but differing more from many so-called tineids in a broad sense than from *noctuidae;* the so-called *tineidae* in a broad sense very heterogeneous, and equivalent to the union of many families recognized as distinct; indication of several diverse groups of genera. *B: P. M.* (4091)

Chevrolat's collection of coleoptera. (Psyche, Apr.-June 1885, v. 4, p. 297, 5 cm.)

Notice of offer for sale of A. Chevrolat's collection of coleoptera, and of some prices asked. *B: P. M.* (4092)

Chigoe (The) in Africa. (Amer. nat., June 1883, v. 17, p. 664.) (Psyche, May-June 1883, v. 4, p. 52, 6 cm.)

Pulex penetrans stated, in Burton and Cameron's "To the Gold coast for gold," to have been introduced and widely spread recently in western Africa; mention of some of the chief arthropodous plagues of that region *B: P. M.* (4093)

Comstock, J: H: *Coccidae* wanted. (Psyche, v. 4, **1883**, p. 2, 22, 42, 62, 82, 102; **1884**, p. 122, 142, 154, 166, *each* 4 cm.)

Advertisement. *B: P. M.* (4094)

[**Cook**, Albert J:] [Extra-floral nectar.] (Psyche, Oct.-Dec. 1884, v. 4, p. 234, 4 cm.)

Notice of paper read by A. J: Cook before Natural history society of the Michigan agricultural college, 12 Sep. 1884; contrast of taste of honey made from secretion due to ergot on grass and of that made from secretions of *aphididae*. *B: P. M.* (4095)

Coquillett, Daniel W: Systematic position of the genus *apiocera*. (Psyche, Jan.-Mch. 1885, v. 4, p. 243-244, 49 cm.)

Critical review of C: R. Osten Sacken's "On the genus *apiocera*" (Berliner entom. zeitschr., 1883, v. 27, p. 287-304); reasons for placing *apiocera* among the *therevidae* rather than among the *asilidae;* characters of *asilidae* and *therevidae* compared; probable variability of *apiocera haruspex*. *B: P. M.* (4096)

Dahl, Friedrich. Habits of spiders. (Psyche, Apr.-June 1885, v. 4, p. 300, 16 cm.)

Extract from partial translation, entitled "Contributions to the biology of spiders" (Ann. and mag. nat. hist., Jan. 1885, s. 5, v. 15, p. 70-72) [Rec., 3826], of author's "Beiträge zur biologie der spinnen" (Zool. anzeiger, 3 Nov. 1884, v. 7, p. 591-595) [Rec., 3825]; notes on the repair of their webs by *zilla x-notata* and other *araneina*, and on the exhibition of intelligence and instinct by *attus arcuatus*. *B: P. M.* (4097)

Data on annual addresses. (Psyche, Jan.-Mch. 1885, v. 4, p. 265, 9 cm.)

List of annual addresses of retiring presidents of Cambridge entomological club. *B: P. M.* (4098)

[**Davison**, W:] Birds nesting in hornets' nests. (Psyche, Oct.-Dec. 1885, v. 4, p. 351, 4 cm.)

Extract from W: Davison's "Birds breeding in ants' nests" (Nature, 12 Mch. 1885, v. 31, p. 448). *B: P. M.* (4099)

[**Davis**, W: T.] [Stridulation of a headless *conocephalus*.] (Science, 7 Nov. 1884, v. 4, p. 448, 4 cm.) (Psyche, Oct.-Dec. 1884, v. 4, p. 235, 6 cm.)

Notice of communication made by W: T. Davis to Natural science association of Staten Island, Oct. 1884. *B: P. M.* (4100)

Dimmock, Anna Katherina. The insects of *betula* in North America. (Psyche, 1885, v. 4: Jan.-Mch., p. 239-243, 142 cm.; Apr.-Jun., p. 271-286, 507 cm.)

List of 107 determined species of insects and of some doubtful ones found on *betula* in North America, with references to the original descriptions and to other important descriptions or accounts of the life-histories of these insects, and with authenticated lists of the other food-plants of the species cited: use of leaves of *betula alba* in rearing polyphagous insects. *B: P. M.* (4101)

Dimmock, Anna Katherina. Sexual attraction in *prionus*. (Psyche, Apr. 1884, v. 4, p. 159, 27 cm.)

Abstract, with remarks [by F. Katter], entitled, "Geschlechtliche anziehung bei coleopteren." (Entom. nachrichten, June 1884, v. 10, p. 183-186.)

Record of observations on the attraction of males of *prionus* by females, and of females by males. *B: P. M.* (4102)

Dimmock, G:, *secretary*, *see* CAMBRIDGE entomological club.

Dimmock, G: [*Blissus leucopterus.*] (Psyche, Nov.-Dec. 1883, v. 4, p. 119, 5 cm.)

Notice of J. A. Lintner's Circular no. 1 of the Department of entomology of the New York state museum of natural history, Oct. 1883; occurrence of *blissus leucopterus* in New York and Massachusetts, in 1883. *B: P. M.* (4103)

Dimmock, G: [Book-notice.] (Psyche, May-June 1883, v. 4, p. 53-54, 9 cm.)

Notice of Proceedings of the Davenport academy of natural sciences, v. 3, pt. 3. *B: P. M.* (4104)

Dimmock, G: [Book notice.] (Psyche, May-June 1883, v. 4, p. 54, 3 cm.)

Notice of *Rovaraszati lapok*, a Hungarian entomological journal. *B: P. M.* (4105)

Dimmock, G: [Dollfus prize in insect anatomy.] (Psyche, May 1884, v. 4, p. 175, 7 cm.)

Notice of offer of prizes to subscribers to *Feuille des jeunes naturalistes* for illustrated anatomical work on the larva of a rhopalocerous lepidopteron. [For notice of award of prize, see G: Dimmock's note [of same title] (*op. cit.*, Oct.-Dec. 1884, p. 234-235) (Rec., 4107).] *B: P. M.* (4106)

Dimmock, G: [Dollfus prize in insect anatomy.] (Psyche, Oct.-Dec. 1884, v. 4, p. 234-235, 5 cm.)

Notice of award of prizes offered by A. Dollfus for work on the anatomy of a lepidopterous larva, and of publication of the prize essays in *Feuille des jeunes naturalistes* in 1884. *B: P. M.* (4107)

Dimmock, G: [Index to Ontario entomological reports.] (Psyche, Jul.-Aug. 1883, v. 4, p. 79, 6 cm.)

Crit. rev. of E. B. Reed's "General index to the thirteen annual reports of the Entomological society of the province of Ontario, 1870-1882," Toronto, 1883. *B: P. M.* (4108)

Dimmock, G: [Leuckart as an educator.] (Psyche, Mch. 1884, v. 4, p. 152.)

Notice of biographical sketch of Prof. R. Leuckart by O. P. Krancher in *Deutscher bienenfreund*, Jan. 1884. *B. P. M.* (4109)

[**Dimmock**, G:] Metamorphoses of arctic insects. (Psyche, Jan.-Mch. 1885, v. 4, p. 268, 32 cm.)

Translated extract from C. Aurivillius' "Das insektenleben in arktischen ländern" in A. E. Nordenskiöld's "Studien und forschungen . . . im hohen norden," Lpz., 1885; periods of time requisite for the development of *oeneis bore*, and presumably of *bombus* and other insects in high northern latitudes; absence of parasites of *bombus* in these regions. *B: P. M.* (4110)

Dimmock, G: [Müller-fund.] (Psyche, Jan.-Feb. 1884, v. 4, p. 139-140, 7 cm.)

Statement of plan and object of fund proposed to be raised in honor of Hermann Müller. *B: P. M.* (4111)

Dimmock, G: Necrology. (Psyche, Jan.-Mch. 1885, v. 4, p. 266, 15 cm.)

List of entomologists recently deceased, with dates of birth and death and with characterization of some of them. *B: P. M.* (4112)

Dimmock, G: New text-book of entomology. (Psyche, Apr.-June 1885, v. 4, p. 299, 10 cm.)

Prospectus of "An elementary text-book of entomology," to be published in London, with plates by W: F. Kirby. *B: P. M.* (4113)

Dimmock, G: Notice to subscribers. (Psyche, Jan.-Feb. 1883, v. 4, p. 20, 6 cm.)

Notice of delay of completion of publication of volume three of PSYCHE. *B: P. M.* (4114)

Dimmock, G: [Obituary notice of Hermann Müller.] (Psyche, Sep.-Oct. 1883, v. 4, p. 100, 9 cm.)

Reference to number and value of Müller's writings. *B: P. M.* (4115)

Dimmock, G: [*Papilio cresphontes* in Massachusetts.] (Psyche, Sep.-Oct. 1883, v. 4, p. 99, 5 cm.)

Record of captures of *papilio cresphontes* and of a capture of *junonia coenia* in Massachusetts, in 1883. *B: P. M.* (4116)

Dimmock, G: [*Pieris spilleri* Spiller.] (Psyche, Apr. 1884, v. 4, p. 163-164, 5 cm.) Reprint. (Sci. record, 15 July 1884, v. 2, p. 210, 6 cm.)

Notice of A. J. Spiller's "Description of a *pieris* new to science. *Pieris spilleri*, mihi" (Entomologist, Mch. 1884, v. 17, p. 62-63), commenting upon author's egotism. *B: P. M.* (4117)

Dimmock, G: Salivary glands in bees. (Psyche, Sep.-Oct. 1883, v. 4, p. 87-89, 72 cm.)

Abstract of P. Schiemenz's "Ueber das herkommen des futtersaftes und die speicheldrüsen der biene" . . . (Zeitschr. f. wissensch. zool., Feb. 1883, v. 38, p. 71-135) [Rec., 3337]. *B: P. M.* (4118)

Dimmock, G: The scales of coleoptera. (Psyche, 1883, v. 4: Jan.-Feb., p. 3-11, fig. 1-3; Mch.-Apr., p. 23-27, fig. 4-7; May-Jun., p. 43-47, fig. 8-11; Jul.-Aug., p. 63-71.)

Advance abstract, by author, with same title. (Science, 23 March 1883, v. 1, p. 203, 11 cm.)

Abstract, by author, entitled, "Scales of coleoptera." (Science, 1 Feb. 1884, v. 3, p. 127-128, 8 fig., 38 cm.)

History and bibliography (45 titles) of knowledge of scales of insects, particularly of coleoptera; enumeration of orders of insects known to possess scales; special description and illustration of hairs and scales of *cicindela dorsalis, anthrenus scrophulariae, a. varius, hoplia coerulea, polyphylla variolosa, valgus squamiger, psiloptera drummondi, chalcolepidius rubripennis, alaus oculatus, elateridae* sp. incog., *ptinus ? rutilus, clytus robiniae, entimus imperialis;* mention of scales of related species; general summary of families of scaled coleoptera, forms of scales, colorational effects produced by scales (with tabulation of such effects according to families), causes of coloration in scales, structure of scales, and methods of study of the subject. *B: P. M.* (4119)

[**Dipterous** larvae in the human stomach.] (Science, 23 Nov. 1883, v. 2, p. 697, 8 cm.) (Psyche, Nov.-Dec. 1883, v. 4, p. 119, 11 cm.)

Notice of communication made by A. Laboulbène at meeting of Société entomologique de France. *B: P. M.* (4120)

Dipterous parasite of the rhinoceros. (Psyche, Oct.-Dec. 1885, v. 4, p. 351-352, 6 cm.)

Notice of F. Brauer's "Entomologische beiträge" (Verh. K.-k. zool.-bot. ges. Wien, 1884, v. 34, p. 269-271). *B: P. M.* (4121)

Distant, W: Lucas. London letter. (Psyche, Sep.-Oct. 1883, v. 4, p. 93-94, 41 cm.)

Statistics of species of insects enumerated and figured, and of new species and genera described in Godman and Salvin's "Biologia centrali-americana," prior to July 1883, according to the several sections of the orders treated; notice of studies of F. Leuthner on mandibular polymorphism of *odontolabidae;* list of works appearing on lepidopterous faunae of several countries and list of entomological collections being made in neotropical countries. *B: P. M.* (4122)

Distant, W: Lucas. London letter. (Psyche, Mch. 1884, v. 4, p. 147-148, 38 cm.)

Notice of a collection of Japanese insects made by G: Lewis, of the intention of G: Semper to publish a work on the *lepidoptera rhopalocera* of the Philippine islands, of the forthcoming of a new edition of R. Trimen's "Rhopalocera Africae australis," of the occurrence of a succession of mild winters in England and the influence of such winters on the abundance of insects in the ensuing summers, of the pecuniary value of entomological literature in London, and of a collection of insects and other specimens made by E: Whymper in Ecuador; remarks on the sudden and plentiful occurrence of *ragadia crisia* in the Malay peninsula, where it was previously unknown. *B: P. M.* (4123)

Dodge, C: Richards. Townend Glover. (Psyche, Nov.-Dec. 1883, v. 4, p. 115-116, 43 cm.)

Biographical notice of Townend Glover; description of his unpublished illustrated work on North American entomology. *B: P. M.* (4124)

Dubois, Albert. Preservation of insects. (Psyche, Jan.-Mch. 1885, v. 4, p. 266, 10 cm.

Translated extract from *Feuille des jeunes naturalistes*, Mch. 1885, v. 15, p. 71; directions for removing verdigris and grease from insects. *B: P. M.* (4125)

Edwards, W: H: On carrying hibernating larvae through the winter. (Can. entom., June 1885, v. 17, p. 113-114.) (Psyche, Oct.-Dec. 1885, v. 4, p. 353-354, 17 cm.)

Successful results of artificial hibernation of several larvae of *rhopalocera*. *B: P. M.* (4126)

Election of honorary members. (Psyche, Apr.-June 1885, v. 4, p. 297, 4 cm.)

Notice of election of honorary members of Société entomologique de France. *B: P. M.* (4127)

Embryology of the silk-worm. (Amer. nat., Apr. 1883, v. 17, p. 444.) (Psyche, Mch.-Apr. 1883, v. 4, p. 39, 4 cm.)

Histology of amnion and origin of malpighian vessels of *bombyx mori* studied by S. Salvatico, and rudiments of genital glands of *tinea crinella* observed by Balbiani. *B: P. M.* (4128)

Entomological club of A. A. A. S. (Psyche, Jan.-Mch. 1885, v. 4, p. 265, 8 cm.)

Official announcement of meeting of Entomological Club of American association for the advancement of Science, to be held 25 Aug. 1885, at Ann Arbor, Mich. *B: P. M.* (4129)

Entomological items. (Psyche, Jan.-Feb. 1883, v. 4, p. 19-20, 39 cm.) *B: P. M.* (4130)

Entomological items. (Psyche, Mch.-Apr. 1883, v. 4, p. 39-40, 44 cm.) *B: P. M.* (4131)

Entomological items. (Psyche, May-June 1883, v. 4, p. 59, 34 cm.) *B: P. M.* (4132)

Entomological items. (Psyche, Jul.-Aug. 1883, v. 4, p. 79-80, 44 cm.) *B: P. M.* (4133)

Entomological items. (Psyche, Sep.-Oct. 1883, v. 4, p. 99-100, 44 cm.) *B: P. M.* (4134)

Entomological items. (Psyche, Nov.-Dec. 1883, v. 4, p. 119-120, 45 cm.) *B: P. M.* (4135)

Entomological items. (Psyche, Jan.-Feb. 1884, v. 4, p. 139-140, 44 cm.) *B: P. M.* (4136)

Entomological items. (Psyche, Mch. 1884, v. 4, p. 151-152, 44 cm.) *B: P. M.* (4137)

Entomological items. (Psyche, Apr. 1884, v. 4, p. 163-164, 45 cm.) *B: P. M.* (4138)

Entomological items. (Psyche, May 1884, v. 4, p. 175-176, 44 cm.) *B: P. M.* (4139)

Entomological items. (Psyche, Jun.-Jul. 1884, v. 4, p. 191-192, 43 cm.) *B: P. M.* (4140)

Entomological items. (Psyche, Aug.-Sep. 1884, v. 4, p. 211, 28 cm.) *B: P. M.* (4141)

Entomological items. (Psyche, Oct.-Dec. 1884, v. 4, p. 233-236, 133 cm.) *B: P. M.* (4142)

Entomological items. (Psyche, Jan.-Mch. 1885, v. 4, p. 265-268, 132 cm.) *B: P. M.* (4143)

Entomological items. (Psyche, Apr.-June 1885, v. 4, p. 297-300, 134 cm.) *B: P. M.* (4144)

Entomological items. (Psyche, Jul.-Sep. 1885, v. 4, p. 327-328, 64 cm.) *B: P. M.* (4145)

Entomological items. (Psyche, Oct-Dec. 1885, v. 4, p. 351-354, 128 cm.) *B: P. M.* (4146)

Entomological society of London. (Psyche, Jul.-Aug. 1883, v. 4, p. 75-76, 22 cm.)

Partial abstract (from *Entomologist's monthly magazine*) of reports of business transacted and communications made at meetings of Entomological society of London, 17 Jan.-2 May 1883. *B: P. M.* (4147)

Entomological society of London. (Psyche, Apr.-June 1885, v. 4, p. 297, 3 cm.)

Royal charter granted to Entomological society of London, 20 July 1885. *B: P. M.* (4148)

Entomological society of London. (Psyche, Jul.-Sep. 1885, v. 4, p. 311-314, 125 cm.)

Partial abstract (from *Transactions of Entomological society of London*, 1883 and 1884) of communications made at meetings of Entomological society of London, 6 June 1883-3 Sep. 1884. *B: P. M.* (4149)

[**Entomological** society of Washington.] (Psyche, May 1884, v. 4, p. 175, 4 cm.)

List of officers of Entomological society of Washington, for 1884. *B: P. M.* (4150)

Entomology during the year 1883. (Psyche, Apr.-June 1885, v. 4, p. 299, 10 cm.)

Translation of "Entomologie während des jahres 1883" (Entom. nachrichten, June 1885, v. 11, p. 191). *B: P. M.* (4151)

Fernald, C: H: *Tortricidae* wanted. (Psyche, 1883, v. 4, p. 2, 22, 42, 62, 82, *each* 3 cm.)

Advertisement. *B: P. M.* (4152)

[**Final** honors in entomology.] (Psyche, Mch. 1884, v. 4, p. 151, 9 cm.)

Statement, from *The Cornell university register*, 1883-84, p. 111, of conditions under which "final honors" in entomology will be conferred upon graduates of The Cornell university. *B: P. M.* (4153)

Food-habits and vesicating power of *cantharis*. (Psyche, Apr.-June 1885, v. 4, p. 298, 7 cm.)

Notice of H. Beauregard's "Sur le mode de développement naturel de la cantharide "(Compt.-rend. Acad. sci. [Paris], 8 June 1885, v. 100, p. 1472-1475)." *B: P. M.* (4154)

Forbes, Stephen Alfred. On the life-histories and immature stages of three *eumolpini*. (Psyche, Jan.-Feb. 1884, v. 4, p. 123-130, 272 cm.; pl. 1, *with 1 p. expl. of pl.*)

Corrective note, by author, with like title . . . "Corrective note." (*op. cit.*, May 1884, p. 167-168, 34 cm.)

Describes larva and pupa of *colaspis brunnea*, *paria aterrima* and *scelodonta nebulosus* (misnamed *s. pubescens*); figures imago of the *paria* and *scelodonta*, pupa of the *scelodonta*, larva of the *colaspis*, head of imago of the *paria*, and larval and pupal characters of the three species; describes and contrasts the life-histories of these species, referring to previous accounts thereof. *B: P. M.* (4155)

Forbes, Stephen Alfred. On the life-histories and immature stages of three *eumolpini* [corr.]. Corrective note. (Psyche, May 1884, v. 4, p. 167-168, 34 cm.)

Corrects and explains erroneous designation of *scelodonta nebulosus* as *s. pubescens* in author's "On the life-histories and immature stages of three *eumolpini*" (*op. cit.*, Jan.-Feb. 1884, p. 123-130) [Rec., 4155]. *B: P. M.* (4156)

Fowler, W. W. Collecting coleoptera. (Psyche, Jan.-Feb. 1883, v. 4, p. 19, 5 cm.)

Extract from *Entomologist*, Oct. 1882, v. 15, p. 231-232; description of a method of collecting coleoptera, of which *staphylinidae*, especially *stenus*, are the commonest, especially in winter. *B: P. M.* (4157)

Friedländer, R. *& sohn*. [Natural science publications.] (Psyche, 1883-1884, v. 4, p. 102, 122, 142, 154, 166, 178, *each* 6 cm.)

Advertisement. *B: P. M.* (4158)

Grote as a composer. (Psyche, Apr.-June 1885, v. 4, p. 297, 4 cm.)

Notice of poems, an essay, and a musical composition by A: R. Grote. *B: P. M.* (4159)

Hagen, Hermann August. The first numero of Thomas Say's American entomology and two letters on the hessian fly hitherto not mentioned among his published papers. (Psyche, Mch. 1884, v. 4, p. 145-146, 54 cm.)

Bibliographical note describing T: Say's "American entomology" . . . v. 1, no. 1, Phil., 1817, corresponding to plates 1, 4, 7, 10, 14 and 18 of Say's work of same title, v. 1, Phil., 1824; notice of two publications by Say in *Memoirs of Philadelphia society for promoting agriculture*, 1818, v. 4, p. 224-226 [Rec., 3431]. 236-237 [Rec., 3430]. *B: P. M.* (4160)

[**Hagen**, Hermann August.] [Hessian fly so called before the Revolution.] (Psyche, Apr. 1884, v. 4, p. 163, 4 cm.)

Notice of H. A. Hagen's "The occurrence of the hessian fly in North America before the Revolution" (Science, 11 Apr. 1884, v. 3, p. 432). *B: P. M.* (4161)

Hagen, Hermann August. On the relations of fungi to galls and to larvae of *cecidomyia* living in galls. (Psyche, Oct.-Dec. 1885, v. 4, p. 334, 28 cm.)

Reprint, with slight amendment, of H. A. Hagen's paper of same title in *Canadian entomologist;* statement of occurrence of several communities consisting of an insect and a fungus parasitic in a plant gall. *B: P. M.* (4162)

Hagen, Hermann August. The tarsal and antennal characters of *psocidae*. (Entom. mo. mag., June 1882, v. 19, p. 12-13.) (Psyche, May-June 1883, v. 4, p. 52, 23 cm.)

Young forms of *atropina* have two-jointed tarsi, the apical joint becoming divided in later life, the intermediate joints of the antennae increasing in number by division when the number of tarsal joints increases. *B: P. M.* (4163)

Hazlewood, Francis Tomlinson. Permanent mounting of tracheae of insects. (Psyche, Jan.-Mch. 1885, v. 4, p. 253, 10 cm.)

Description of new method of mounting soft parts of insects permanently for the microscope. *B: P. M.* (4164)

[**Hermaphroditic** lepidoptera.] (Psyche, Jul. 1884, v. 4, p. 192, 8 cm.)

Notice of G. Weymer's "Zwei lepidopteren-hermaphroditen von *apatura iris* L. und *nemeophila russula* L." (Jahresber. d. Naturw. ver. in Elberfeld, 1884, heft 6, p. 74-77), and of C. Cornelius' "Verzeichniss der käfer von Elberfeld und dessen nachbarschaft" . . . (*op. cit.*, p. 1-61). *B: P. M.* (4165)

[**Hinckley**, Mary H.] [Enemies of tadpoles.] (Psyche, Oct.-Dec. 1884, v. 4, p. 235, 5 cm.)

Partial notice of M. H. Hinckley's "Notes on the peeping frog . . ." (Mem. Bost. soc. nat. hist., May 1884, v. 3, no. 10); mention of insect and other enemies of larvae of *hyla pickeringii*. *B: P. M.* (4166)

Howard, Leland Ossian. Museum pests of service to the entomologist. (Psyche, Jan.-Feb. 1884, v. 4, p. 132, 12 cm.)

Delicate specimens of insects dissected better by *trogoderma tarsale* than by the student. *B: P. M.* (4167)

Howard, Leland Ossian. Notice of an omission from Leconte's edition of Thomas Say's writings. (Psyche, Aug.-Sep. 1884, v. 4, p. 206, 15 cm.)

Reprint of note by T: Say, from *Journal of the Academy of natural sciences, of Philadelphia*, Aug. 1817, v. 1, p. 63, supplementary to Say's "Some account of the insect known by the name of hessian fly . . ." (Journ. etc., July 1817, v. 1, p. 45-48), and not reprinted in J: L. Leconte's edition of Say's "Complete writings;" comments on Say's erroneous statement that *ceraphron destructor* sheds its wings after breeding; brachypterous individuals occur not uncommonly among *pteromalinae*. *B: P. M.* (4168)

Howgate, E: The process of skin-casting in a lepidopterous larva. (Naturalist, Nov. 1885, p. 366.) (Psyche, Jul.-Sep. 1885, v. 4, p. 327, 22 cm.)

Brief description of the manner in which a geometrid larva cast its skin. *B: P. M.* (4169)

Hubbard, H: Guernsey. Notes on the habits of *hypotrichia spissipes* Lec., with description of the females. (Psyche, Oct.-Dec. 1884, v. 4, p. 215-217, 78 cm., fig. 13.)

Description of method of flight and diurnal habits of male *hypotrichia spissipes;* description of female imago, with figure of antenna and front tibia and tarsus of male and of female; taxonomic relations of *hypotrichia*, *plectrodes* and *pleocoma*. *B: P. M.* (4170)

[**Hudson**, G: Vernon.] Pupal retreat of *charagia virescens*. (Psyche, Jan.-Mch. 1885, v. 4, p. 267, 23 cm.)

Extracts from G: V. Hudson's "Life-history of *charagia virescens*" (Entomologist, Feb. 1885, v. 18, p. 30-36). *B: P. M.* (4171)

Insects mistaking leaves for flowers. (Psyche, Apr.-June 1885, v. 4, p. 298, 9 cm.)

Extract from *Entom. mo. mag.*, May 1885, v. 21, p. 278, of a communication made by R. M. Christy and J: J. Weir to Entomological society of London, 1 April 1885. *B: P. M.* (4172)

Introduction of humble-bees into New Zealand. (Psyche, Apr.-June 1885, v. 4, p. 297, 4 cm.)

After repeated attempts, living *bombus* have been carried from England to New Zealand, to fertilize *trifolium pratense*. *B: P. M.* (4173)

Jack, J: G: A curious habit of *callosamia promethea*. (Psyche, May 1884, v. 4, p. 169, 26 cm.)

Observation on the method by which *callosamia promethea* gains access to long-petioled leaves as food. *B: P. M.* (4174)

[**Jones**, E. D.] Drinking habit of a moth. (Journ. Roy. micros. soc., Oct. 1884, s. 2, v. 4, p. 741.) (Psyche, Oct.-Dec. 1884, v. 4, p. 217, 16 cm.)

Abstract of a paper by E. D. Jones (Proc. Lit. and phil. soc. Liverpool, 1883, v. 37, p. 76-77); imagos of *panthera pardalaria* observed to suck up water and pass it through the body in a continuous stream; structural adaptation of the moth to its surroundings. *B: P. M.* (4175)

[**Jordan**, R. C. R.] [Apterous female lepidoptera.] (Psyche, Apr. 1884, v. 4, p. 163, 5 cm.)

List, abstracted from R. C. R. Jordan's "On the European species of lepidoptera with apterous or subapterous females" (Entom. mo. mag., Mch. 1884, v. 20, p. 219-221), of European families of lepidoptera containing apterous or subapterous females. *B: P. M.* (4176)

Karsch, Ferdinand Anton Franz. The entomocecidia. Introduction. (Psyche, Oct.-Dec. 1885, v. 4, p. 331-334, 105 cm.)

Transl., by B: P. Mann, of F. A. F. Karsch's "Die entomocecidien" (Entom. nachrichten, Jul. 1884, v. 10, p. 205-209); definition of the nature of galls, list of orders of animals which produce galls, references to prominent monographs on certain classes of galls, and plan of formation of a comprehensive list of galls of insects. *B: P. M.* (4177)

[**Kent**, W. Saville.] Infusorial parasites of white ants. (Psyche, Apr.-June 1885, v. 4, p. 298, 8 cm.)

Notice of communication made by W. S. Kent to Royal society of Tasmania, 17 Nov. 1884, on infusoria found in *termitidae*. *B: P. M.* (4178)

Krancher, Oskar Paul. Want of symmetry among insects. (Psyche, Aug.-Sep. 1884, v. 4, p. 200-203, 91 cm., fig. 12.)

Remarks on the prevalent general symmetry of form and coloration in insects, and the rarity of perfect symmetry or of exact similarity of specimens of one species; remarks on varieties, gynandromorphs and cripples; description and figure of a symmetrical cripple of *aporia crataegi;* description of irregularities in cells of *apis mellifica*. *B: P. M.* (4179)

Krauss, W: Christopher. On the nervous system of the head of the larva of *corydalus cornutus* Linn. (Psyche, Jun.-Jul. 1884, v. 4. p. 179-184. 163 cm., pl. 2, *with* [1 *p.*] *expl. of pl.*)

Detailed illustrated description of the anatomy of the nervous system of the head of the larva of *corydalus cornutus*, extracted from a thesis presented to the faculty of the Cornell university for the baccalaureate in science. *B: P. M.* (4180)

Landerer, Xaver. [Locusts used as food.] (Psyche, Mch.-Apr. 1883, v. 4, p. 39, 5 cm.)

Translated extract from *Deutsch-amerikanische apotheker-zeitung*, 1 Mch. 1883. *B: P. M.* (4181)

Landerer, Xaver. [Manna.] (Psyche, Jun.-Jul. 1884, v. 4, p. 191-192, 8 cm.)

Translated extract from *Deutsch-amerikanische apotheker-zeitung*, 15 May 1882, v. 3, p. 134. *B: P. M.* (4182)

[**Landerer**, Xaver.] Upon a peculiar oriental locality for honey. (Psyche, Jan.-Mch. 1885, v. 4, p. 266-267, 19 cm.)

Translated extract from X. Landerer's "Mittheilungen aus dem orient" (Deutsch-amer. apotheker-zeitung, 15 Dec. 1882, v. 3, p. 582); an intoxicating, soporific honey obtained in Persia probably from flowers of *papaver;* use of this honey as medicine and otherwise, and use of opium in Persia. *B: P. M.* (4183)

Lange, C. F. Exchange of European and American coleoptera. (Psyche, Oct.-Dec. 1884, v. 4, p. 233, 3 cm.)

Advertisement. *B: P. M.* (4184)

[**Leaping** ant.] (Science, 14 Sep. 1883, v. 2, p. 386, 4 cm.) (Psyche, Sep.-Oct. 1883, v. 4, p. 99, 5 cm.)

Notice of communication by E. Lefèvre at meeting of Société entomologique de France, 11 July 1883. *B: P. M.* (4185)

[**Leconte**, J: Lawrence; obituary notice of.] (Psyche, Nov.-Dec. 1883, v. 4, p. 119, 10 cm.)

Obituary notice of J: Lawrence Leconte; explanatory note regarding C: V. Riley's "Tribute to the memory of John Lawrence Leconte" (*hoc op.*, p. 107-110) [Rec., 4263]. *B: P. M.* (4186)

[**Leidy**, Joseph.] [Habits of *lasius interjectus.*] (Psyche, Jan.-Feb. 1883, v. 4, p. 19, 5 cm.)

Abundance of *lasius interjectus* near Philadelphia, Pa.; care of aphids and coccids by this ant. *B: P. M.* (4187)

[**Lendenfeld**, R.] [Muscular contraction in flight.] (Science, 19 Dec. 1884, v. 4, p. 562, 2 cm.) (Psyche, Oct.-Dec. 1884, v. 4, p. 234, 4 cm.)

Notice of paper read by Dr. R. Lendenfeld before Linnean society of New South Wales, 29 Oct. 1884; muscular contraction stated to occur in flight of insects. *B: P. M.* (4188)

Life of Dr. Dzierzon. (Psyche, Oct.-Dec. 1885, v. 4, p. 351, 5 cm.)

Notice of a biographical sketch of Johann Dzierzon by O. P. Krancher in *Deutscher bienenfreund*, Jan. 1885. *B: P. M.* (4189)

Linnean society of London. (Psyche, May-June 1883, v. 4, p. 54. 13 cm.)

Abstract (from *Zoologischer anzeiger*, 5 Mch. 1883, v. 6, p. 127-128) of communication made by J. M. Campbell, at meeting of Linnean society of London, 6 Feb. 1883, on pairing of *tegenaria guyonii*, with description of some glands on the abdominal sexual region of the male of this species. *B: P. M.* (4190)

Linnean society of London. (Psyche, Sep.-Oct. 1883, v. 4, p. 92-93, 33 cm.)

Partial abstract (from *Zoologischer anzeiger*) of communications made at meetings of Linnean society of London, 15 Feb.–7 June 1883. *B: P. M.* (4191)

Linnean society of London. (Psyche, Aug.-Sep. 1884, v. 4, p. 206, 11 cm.)

Partial abstract (from *Zoologischer anzeiger*, by J. Murie) of communications made at meetings of Linnean society of London, 20 Dec. 1883 and 17 Jan. 1884. *B: P. M.* (4192)

Linnean society of London. (Psyche, Jan.-Mch. 1885, v. 4, p. 254, 29 cm.)

Partial abstract (from *Zoologischer anzeiger*, by J. Murie) of communications made at meetings of Linnean society of London, 21 Feb.–20 Nov. 1884. *B: P. M.* (4193)

Linnean society of New South Wales. (Psyche, Jul.-Aug. 1883, v. 4, p. 76, 9 cm.)

Abstract (from *Zoologischer anzeiger*, 9 Jul. 1883, v. 6, p. 376) of communication made by W: Macleay at meeting of Linnean society of New South Wales, 25 Apr. 1883; account of ravages of a tineid moth in vegetable gardens at Sydney, N. S. W.; exhibition (by — Stevens) of chrysalis of *danais* attached to leaf of *pelargonium*. *B: P. M* (4194)

Linnean society of New South Wales. (Psyche, Apr.-Jun. 1885, v. 4, p. 287-288, 19 cm.)

Partial abstract (from *Zoologischer anzeiger*) of communications made at meetings of Linnean society of New South Wales, 29 Aug. 1883–31 Dec. 1884. *B: P. M.* (4195)

Lintner, Joseph Albert. Book notice. (Psyche, May-June 1883, v. 4, p. 53, 11 cm.)

Anticipatory notice of W: Saunders' "Insects injurious to fruits," Phil., 1883: need, value and scope of the work. *B: P. M.* (4196)

Lintner, Joseph Albert. Captures of *feniseca tarquinius* Fabr. (Psyche, Jul.-Aug. 1883, v. 4, p. 75, 14 cm.)

Record of several captures of *feniseca tarquinius* in eastern New York. *B: P. M.* (4197)

Lintner, Joseph Albert. [Collection of "cut-worms."] (Psyche, Jul.-Aug. 1883, v. 4, p. 80, 10 cm.)

Notice of paper read by Mrs. Mary Treat before New Jersey state horticultural society, in January 1883; attraction of cut-worms to *phlox*, and their collection therefrom. *B: P. M.* (4198)

Lintner, Joseph Albert. On an egg-parasite of the currant saw-fly, *nematus ventricosus*. (Psyche, May-June 1883, v. 4, p. 48-51, 128 cm.)

Observations made in 1866, 1867 and 1868, upon the food-habits and oviposition of *trichogramma pretiosa*, with reprint of comments by Asa Fitch thereon (12th ann. rept. ins. N. Y. for 1867) (Trans. N. Y. state agric. soc. for 1867, 1868, v. 27), p. 931-932; rediscovery of this parasite in 1882; attempt to scatter specimens over United States and Canada; other occurrences and known hosts of the insect; parasitism of *t. minuta* in eggs of *limenitis disippus;* oviposition of *nematus ventricosus*. *B: P. M.* (4199)

Lintner, Joseph Albert. A new sexual character in the pupae of some lepidoptera. (Psyche, Nov.-Dec. 1883, v. 4, p. 103-106, 133 cm.)

Mention of primary and secondary sexual characters hitherto observed in insect imagos and pupae, and presumed characters discovered in pupae of *cossinae* and *aegeriidae*. *B: P. M.* (4200)

Lintner, Joseph Albert. [*Platygaster* larva parasitic upon galls of *cecidomyia salicis-batatus*.] (Psyche, Jul.-Aug. 1883, v. 4, p. 79, 8 cm.)

Notice of D: S. Kellicott's account, in *Bulletin of the Buffalo naturalists' field club*, Mch. 1883, of *platygaster* larva parasitic upon galls of *cecidomyia salicis-batatus*. *B: P. M.* (4201)

Lintner, Joseph Albert. Rearing lepidoptera. (Psyche. May-June 1883, v. 4, p. 53, 14 cm.)

Notice of labors and success of S. L. Elliot in breeding and rearing lepidoptera, and carrying pupae through the winter. *B: P. M.* (4202)

[**Löw**, Franz.] Waxy secretions of psyllid larvae. (Psyche, Jul.-Sep. 1885, v. 4, p. 310, 9 cm.)

Translated extract from F. Löw's "Beiträge zur kenntniss der jugendstadien der psylliden" (Verh. K.-k. zool. bot. gesells. in Wien, 1884, v. 34) [Rec., 4014]. *B: P. M.* (4203)

[**Looss**, —.] New solvent of chitin. (Psyche, Apr.-Jun. 1885, v. 4, p. 286, 19 cm.)

Abstract of —. Looss' "Neue lösungsmittel des chitins" (Zool. anzeiger, 1 June 1885, v. 8, p. 333-334). *B. P. M.* (4204)

[**Lowne**, B: Thompson.] [Compound vision of insects.] (Psyche, Oct.-Dec. 1884, v. 4, p. 235, 9 cm.)

Extract from report by J. Murie, in *Zoologischer anzeiger*, 3 March 1884, v. 7, p. 127, of meeting of Linnean society of London, 7 Feb. 1884. [Author's name given as B. J. Lowne.] *B: P. M.* (4205)

Lugger, O: Food-plants of beetles bred in Maryland. (Psyche, Aug.-Sep. 1884, v. 4, p. 203-204, 24 cm.)

List of 37 coleoptera and of the trees from the wood (in one case seed) of which they were respectively bred. *B: P. M.* (4206)

[**Lugger**, O:] [Parasites of *tiphia*.] (Science record, 15 Aug. 1884, v. 2, p. 232.) (Psyche, Aug.-Sep. 1884, v. 4, p. 211, 7 cm.)

Crit. rev., by C: V. Riley, entitled "Parasites of the larva of *lachnosterna fusca*." (Psyche, Oct.-Dec. 1884, v. 4, p. 224, 9 cm.)

Hymenopterous parasites occurring in cocoons of *tiphia*, the larvae of the *tiphia* being infested by larvae of *rhipiphorus pectinatus* or *r. limbatus* and being themselves parasitic on larvae of *lachnosterna fusca;* the first mentioned parasites supposed to prey upon the *rhipiphorus*. *B: P. M.* (4207)

[**Macleay**, W:] [Helix-like egg-cases.] (Psyche, Oct.-Dec. 1884, v. 4, p. 235, 4 cm.)

Notice of communication made by W: Macleay to Linnean society of New South Wales, June 1884. *B: P. M.* (4208)

Macloskie, G: Gills of insect-larvae. (Psyche, Nov.-Dec. 1883, v. 4, p. 110-112, 68 cm.)

Nature of gills of insect-larvae defined; contrary to the view usually held regarding them, the tracheae therein terminate caecally and not in recurrent loops; action of tracheae tidal. *B: P. M.* (4209)

Macloskie, G: Head of larval *musca:* preliminary note. (Psyche, Oct.-Dec. 1884, v. 4, p. 218-219, 44 cm.)

Description of structure of head in larva of *musca caesar*, homologizing the several parts with those of imago. *B: P. M.* (4210)

[**Maeklin**, F: W:; obituary notice of.] (Psyche, Mch.-Apr. 1883, v. 4, p. 39, 6 cm.)

Extract from *American naturalist*, Apr. 1883, v. 17, p. 424. *B: P. M.* (4211)

Mann, B: Pickman, *treasurer*. Acknowledgement of contributions. (Psyche, Aug.-Sep. 1884, v. 4, p. 211-212, 39 cm.) *B: P. M.* (4212)

Mann. B: Pickman, *treasurer*. Acknowledgments. (Psyche, Oct.-Dec. 1885, v. 4, p. 330, 7 cm.)

Acknowledgment of contributions to permanent publication fund of PSYCHE. *B: P. M.* (4213)

Mann, B: Pickman, *ed*. Bibliographical record. (Psyche, 1883-1885, v. 4, p. 15-18, 33-38, 55-58, 77-78, 95-98, 117-118, 135-138, 149-150, 161-162, 171-174, 187-190, 207-210, 227-232, 255-264, 289-296, 315-326, 339-350, 350*-350**.)

List of publications on entomology, being no. 3101-4300 of the Bibliographical record of PSYCHE, containing exact titles of and references to and brief analyses of each publication recorded, with occasional explanations of the method of record. *B: P. M.* (4214)

Mann, B: Pickman. The bibliography of entomology. Annual address of the retiring president of the Cambridge entomological club, 11 January 1884. (Psyche, Apr. 1884, v. 4, p. 155-159. 135 cm.)

7th annual address of retiring president of Cambridge entomological club; remarks upon the interest of the club in bibliographical work, upon the importance of bibliography, upon the scope of existing periodicals of zoological bibliography, upon the value of H. A. Hagen's "Bibliotheca entomologica" [Rec., 3306], and upon the Bibliographical record of PSYCHE.
B: P. M. (4215)

Mann, B: Pickman. [Biographical notice of W: C. Krauss.] (Psyche, Jun.-Jul. 1884, v. 4, p. 191, 7 cm.)

Notice of graduation of W: Christopher Krauss from The Cornell university, 19 June 1884; extension of welcome to philosophical entomologists. *B: P. M.* (4216)

Mann, B: Pickman. Close of volume four. (Psyche, Oct.-Dec. 1885, v. 4, p. 335, 11 cm.)

Valedictory address of B: P. Mann as managing editor of PSYCHE; explanation of the scope of the systematic and alphabetic indices of volume four.
B: P. M. (4217)

Mann, B: Pickman. Contribution to the knowledge of parasitic life in galls. (Psyche, Sep.-Oct. 1883, v. 4 p. 89-91, 88 cm.)

Engl. transl. of G. F. Möllers "Bidrag till kännedomen om parasitlifvet i galläpplen" . . . (Entom. tidskr., 1882, v. 3, p. 182-186) [Rec., 3397]; lists of insects other than the gall-makers raised from galls of several species of *cynipidae* in Sweden. *B: P. M.* (4218)

Mann, B: Pickman, *transl.* The double role of the sting of the honey-bee. (Psyche, Jan.-Mch. 1885, v. 4, p. 251-252, 66 cm.)

Translation, by B: P. Mann, of "Ueber eine doppelrolle des stachels der honigbienen" (Deutsch-amer. apotheker-zeitung, 15 Jan. 1885, v. 5, p. 664) [Rec., 3722].
B: P. M. (4219)

Mann, B: Pickman, *secretary.* [Entomological society of Washington.] (Psyche, Mch. 1884, v. 4, p. 151, 5 cm.).

Notice of preliminary organization of Entomological society of Washington, 29 Feb. 1884. *B: P. M.* (4220)

Mann, B: Pickman. *Eudamus tityrus* flying at night. (Psyche, Oct.-Dec. 1885, v. 4, p. 352, 10 cm.)

Communication made to Cambridge entomological club, 11 Dec. 1885; behavior of *eudamus tityrus* attracted to artificial light at night. *B: P. M.* (4221)

Mann, B: Pickman. False dates. (Psyche, Mch.-Apr. 1883, v. 4, p. 31-32, 45 cm.)

Comments on the value of a systematic statement of dates of issue of scientific periodicals, and the falsity as well as unreliability of such statements when made in connection with the issues dated; thesis illustrated by a table of announced and actual dates of issue of volumes 20 and 21 of *Proceedings of Boston society of natural history.* *B: P. M.* (4222)

Mann, B: Pickman. Food-plants of *pulvinaria innumerabilis.* (Psyche, Oct.-Dec. 1884, v. 4, p. 224, 20 cm.)

List of food-plants of *pulvinaria innumerabilis*, compiled from various authorities: type specimens deposited in Museum of comparative zoology, Cambridge, Mass. *B: P. M.* (4223)

Mann, B: Pickman. Francis Gregory Sanborn. (Psyche, Aug.-Sep. 1884, v. 4, p. 205, 26 cm.)

Obituary notice of Francis Gregory Sanborn.
B: P. M. (4224)

Mann, B: Pickman. Herbert Knowles Morrison. (Psyche, Apr.-Jun. 1885, v. 4, p. 287, 22 cm.)

Obituary notice of H. K. Morrison. *B: P. M.* (4225)

Mann, B: Pickman. Index to entomological literature. (Psyche, 1884-1885, v. 4, p. 214, 238, 270, 302, *each* 4 cm.)

Advertisement. *B: P. M.* (4226)

Mann, B: Pickman. Index to entomological literature. (Psyche, Oct.-Dec. 1884, v. 4, p. 223, 27 cm.)

Remarks upon the economy of a division of labor by which special students may be spared the necessity of searching through miscellaneous literature for writings upon their specialties; statement of plan for such division of labor; solicitation of contribution of special reference lists to the pages of PSYCHE.
B: P. M. (4227)

Mann, B: Pickman. The influence of meteorological conditions on insect life. (Psyche, Sep.-Oct. 1883, v. 4, p. 83-87, 146 cm.)

Abstract of C: G. Barrett's paper of same title (Entom. mo. mag., June 1882, v. 19, p. 1-8) [Rec., 3389]; effect of severely cold winters in promoting the abundance of certain species of lepidoptera, and of wet weather in destroying other species. *B: P. M.* (4228)

Mann, B: Pickman *and* **Dimmock**, G: Introduction to the fourth volume. (Psyche Jan.-Feb. 1883, v. 4, p. 12-13. 36 cm.)

Statement of the material and editorial conditions under which the publication of the fourth volume of PSYCHE is inaugurated. *B: P. M.* (4229)

Mann, B: Pickman. [References to galls and gall-insects.] (Psyche, Mch. 1884, v. 4, p. 147, 6 cm.)

Notice of publication in Bibliographical record of PSYCHE, of references to galls and gall-insects, and reservation of references not ready for publication; offer to supply manuscript references in exchange for equivalent returns. *B: P. M.* (4230)

Mann, B: Pickman. Review. (Psyche Jun.-Jul. 1884, v. 4, p. 185, 28 cm.)

Critical notice of J: H: Comstock's "(A fragment a) Guide to practical work in elementary entomology" [Rec., 3508]; comments on the peculiar terms of entomological description used in the work. *B: P. M.* (4231)

Mann, B: Pickman. Vactor Tousey Chambers. (Psyche, Sep.-Oct. 1883, v. 4, p. 94, 15 cm.)

Biographical notice of Vactor Tousey Chambers; list of his entomological writings recorded in PSYCHE. *B: P. M.* (4232)

Mann's reference indexes. (Psyche, Oct.-Dec. 1885, v. 4, p. 330, 2 cm.)

Advertisement. *B: P. M.* (4233)

[**Medicinal** use of *blatta orientalis*.] (Psyche, Nov.-Dec. 1883, v. 4, p. 119-120, 11 cm.)

Extract from abstract (in *Deutsch-amerikanische apotheker-zeitung*, 1 Apr. 1883, v. 4, p. 49) of paper by T. Bogomolow (in *St. Petersburg medicinische wochenschrift*). *B: P. M.* (4234)

Müller, Fritz. Butterflies as botanists. (Nature, 10 Jul. 1884, v. 30, p. 240.) (Psyche, June-Jul. 1884, v. 4, p. 191, 7 cm.)

The use of certain plants as food by lepidoptera revealed an appreciation of the true relationship of the genera before the same was recognized by authors. *B: P. M.* (4235)

[**Müller**, Hermann; memoir of.] (Amer. nat., Aug. 1884, v. 18, p. 848.) (Psyche, Aug.-Sep. 1884, v. 4, p. 211, 3 cm.)

Notice of publication, by Ernst Krause, of memoir with portrait and list of writings of Hermann Müller. *B: P. M.* (4236)

Munn & co. Patents. (Psyche, 1883-1885, v. 4, p. 102, 122, 142, 154, 166, 178, 194, *each* 4 cm; p. 302, 9 cm.)

Advertisements. *B: P. M.* (4237)

Munn & co. Scientific american. (Psyche, 1884-1885, v. 4, p. 214, 238, 270, *each* 8 cm.)

Advertisement. *B: P. M.* (4238)

Murtfeldt, Mary Esther. A butterfly attracted by lamp-light. (Psyche, Aug.-Sep. 1884, v. 4, p. 206, 7 cm.)

Narration of two instances of the attraction of *apatura lycaon* by lamp-light at night. *B: P. M.* (4239)

Murtfeldt, Mary Esther. Sexual characters in the chrysalids of *grapta interrogationis*. (Psyche, Jun.-Jul. 1884, v. 4, p. 184, 17 cm.)

Statement that pale and gilded chrysalids of *grapta interrogationis* yielded female imagos, while males were obtained from darker colored chrysalids without brilliant ornamentation. *B: P. M.* (4240)

[**Necrology**.] (Psyche, Jun.-Jul. 1884, v. 4, p. 191, 4 cm.)

Obituary notices of J. C. Schiödte, Edwin Birchall and W: Prest. *B: P. M.* (4241)

[**Necrology**.] (Psyche, Oct.-Dec. 1884, v. 4, p. 236, 13 cm.)

List of entomologists recently deceased, with dates of the birth and death and with characterization of some of them. *B: P. M.* (4242)

[**New** scientific journals.] (Psyche, Mch. 1884, v. 4, p. 151. 13 cm.)

Notice of several ephemeral scientific periodicals recently begun, and condemnation of the waste of effort involved in such publications. *B: P. M.* (4243)

Notices to entomologists. (Psyche, May-June 1883, v. 4, p. 60, 10 cm.)

Call, by J. A. Lintner, of a meeting of entomologists to be held at Minneapolis, Minn., 15 Aug. 1883; and by B: P. Mann and G: Dimmock, of a special public meeting of Cambridge entomological club to be held at the same place, 14 Aug. 1883. *B: P. M.* (4244)

[**Ord**, W: M.] Erosion of glass. (Psyche, Oct.-Dec. 1885, v. 4, p. 352, 8 cm.)

Abstract of W: M. Ord's "Erosion of glass" (Nature, 19 Feb. 1885, v. 31, p. 360); chemical explanation of erosion of glass by "mud" formed by *termitina*. *B: P. M.* (4245)

Osborne, J: A. [Position of embryo in eggs of insects.] (Psyche, May 1884, v. 4, p. 175-176, 9 cm.)

Extract from J: A. Osborne's "Some further observations on the parthenogenesis of *saraea fasciata*" . . . (Entom. mo. mag., Dec. 1883, v. 20, p. 145-148). *B: P. M.* (4246)

Parasitic [corr.] nematods. (Psyche, Oct.-Dec. 1885, v. 4, p. 352-353, 10 cm.)

Notice of communication made by H. Gadeau de Kerville to Société entomologique de France, 9 Sep. 1885, and of O: Linstow's "Compendium der helminthologie" . . . Hannover, 1878 [Rec., 3119]. *B: P. M.* (4247)

[**Passerini**, Napoleone.] Observations on decapitated silkworm moths. (Psyche, Apr.-Jun. 1885, v. 4, p. 288, 17 cm.)

Abstract of N. Passerini's "Esperienze sulla decapitazione delle farfalle del baco da seta" (Bull. Soc. entom. ital., 31 Dec. 1884, v. 16, p. 285-286). *B: P. M.* (4248)

Patton, W: Hampton. Sound-producing organs in *anomala*, *anthonomus*, and other coleoptera. (Psyche, Mch. 1884, v. 4, p. 146. 15 cm.)

Statement of occurrence of stridulating organs in several *scarabaeidae* and *elateridae* and in *curculionidae;* description of location of these organs. *B: P. M.* (4249)

[**Phylloxera** in Silesia.] (Science, 21 Nov. 1884, v. 4, p. 481, 2 cm.) (Psyche, Oct.-Dec. 1884, v. 4, p. 233, 2 cm.)

Notice of appearance of *phylloxera vitifoliae* in Proskau, Silesia. *B: P. M.* (4250)

[**Phylloxera** precautions at Argentine custom-house.) (Psyche, Jan.-Feb. 1884, v. 4, p. 139, 4 cm.)

Notice, translated from *El nacional*, 8 Sep. 1883, p. 1, col. 8, of prohibition of importation of grape-vines at Buenos Aires, to avoid danger of introduction of *phylloxera vitifoliae*. *B: P. M.* (4251)

[**Phytophagous** *carabidae.*] (Psyche, Oct.-Dec. 1884, v. 4, p. 234, 4 cm.)

Notice of communications by A. C. Horner and T. H. Hart, in *Entomologist*, Oct. and Nov. 1884. *B: P. M.* (4252)

[**Poujade**, Gustave Arthur.] [Predominance of genital functions.] (Psyche, Oct.-Dec. 1884, v. 4, p. 236, 11 cm.)

Translation of communication made by G. A. Poujade to Société entomologique de France, 23 July 1884; movements of genital organs in *brephos*, *rhodocera rhamni* and *lucanus cervus* observed after these insects were otherwise dead. *B: P. M.* (4253)

[**Practical naturalist** (The).] (Psyche, Nov.-Dec. 1883, v. 4, p. 116, 6 cm.)

Notice of *Practical naturalist*, no. 1-7, published by Ward and Riley at Bradford, England. *B: P. M.* (4254)

[**Preparation** of duplicate coleoptera.] (Psyche, Jan.-Feb. 1884, v. 4, p. 140, 6 cm.)

Reprint from *Science record*, Nov. 1883, v. 2, p. 15-16; recipe for a solution, such as that used by J: B. Smith, in which to soak certain insects to render them not liable to break. *B: P. M.* (4255)

Preservation of honey. (Sci. amer., 18 Nov. 1882, [v. 61], n. s., v. 47, p. 324.) (Psyche, Jan.-Feb. 1883, v. 4, p. 19, 4 cm.)

Presence of formic acic in crude honey, and effect of this acid in preventing fermentation. *B: P. M.* (4256)

Preservation of insects. (Psyche, Apr.-June 1885, v. 4, p. 298, 8 cm.)

Translation of a paper in *Feuille des jeunes naturalistes*, Apr. 1885, v. 15, p. 81; method of use of solution of naphthalin in benzin to prepare hairless insects for the cabinet (by —. Jacobs); verdigris removed from pins by ammonia (by C: Zuber). *B: P. M.* (4257)

Prize work on tactile organs. (Psyche, Oct.-Dec. 1885, v. 4, p. 351, 2 cm.)

Notice of grant, by Académie des sciences de France, to J. Chatin, of grand prize for a work on tactile organs of insects and crustacea. *B: P. M.* (4258)

Proceedings of societies. (Psyche, 1883-1885, v. 4, p. 13-14, 32, 54, 75-76, 92-93, 116, 133-134, 147, 160, 170, 186, 206, 224-226, 253-254, 287-288, 311-314, 335-338.)

For further record, see names of respective societies. *B: P. M.* (4259)

Prognostications of weather by insects. (Psyche, Jul.-Sep. 1885, v. 4, p. 327-328, 41 cm.)

Notice, extracted from "[Bees as storm-warners]" (Nature, 23 Apr. 1885, v. 31, p. 587), of article by —. Emmerig (Natur, 1885, no. 17), on the behavior of *apis mellifica* as indicative of the approach of thunderstorms; extracts from and references to other articles on the subject. *B: P. M.* (4260)

Riley, C: Valentine. Galls and gall insects. (Psyche, 1883, v. 4, p. 2, 22, 42, 62, 82, *each* 3 cm.)

Advertisement. *B: P. M.* (4261)

Riley, C: Valentine. Parasites of the larva of *lachnosterna fusca*. (Psyche, Oct.-Dec. 1884, v. 4, p. 224, 9 cm.)

Crit. rev. of [O: Lugger's] "[Parasites of *tiphia*]" (Psyche, Aug.-Sep. 1884, v. 4, p. 211) [Rec. 4207]; *tiphia* larvae externally parasitic on larvae of *lachnosterna fusca*, beginning to feed as soon as hatched; eggs of *rhipiphorus* probably laid on flowers frequented by *tiphia*, the triungulins attaching themselves to the *tiphia* and carried by it to the nest. *B: P. M.* (4262)

Riley, C: Valentine. Tribute to the memory of John Lawrence Leconte. (Psyche, Nov.-Dec. 1883, v. 4, p. 107-110.)

Separate. [Cambridge, Mass., Feb. 1884.] n. t.-p., p. 107-110, 25 × 18.

Notice. (Psyche, *ut cit.*, p. 119.)

Germ. tr., [by F. Katter], entitled, "Zum gedächtniss von John Lawrence Leconte." (Entom. nachrichten, June 1884, jahrg. 10, p. 183-186.)

Biographical notice of J: L. Leconte; amount, character and importance of Leconte's work and writings; his personal character; his relations with G: H: Horn; disposition of his entomological collection. *B: P. M.* (4263)

[**Ross**, M. Louisa.] South American insects for sale. (Psyche, Jan.-Mch. 1885, v. 4, p. 265, 5 cm.)

Advertisement. *B: P. M.* (4264)

R[ye], E: Caldwell. Influence of color on insects. (Psyche, Nov.-Dec. 1883, v. 4, p. 114, 16 cm.)

Extract from E. F. imThurn's account (*Timehri*, v. 1, pt. 2, p. 223) of a visit to Mt. Russell in Guiana; yellow butterflies attracted to yellow flowers, and blue *morpho* to decaying banana-skins, but red species not attracted to red fruit; butterflies entrapped under a basket. *B: P. M.* (4265)

[**Saunders**, Sidney Smith; obituary notice of.] (Nature, 17 Apr. 1884, v. 29, p. 581.) (Psyche, May 1884, v. 4, p. 175, 4 cm.)

Sir Sidney Smith Saunders, entomologist, b. June 1809, d. 15 April 1884; especial student of *stylopidae*. *B: P. M.* (4266)

[**Schulgin**, M.] [Imbedding material.] (Psyche, Jan.-Feb. 1883, v. 4, p. 19, 3 cm.)

Notice of M. Schulgin's" Zur technik der histologie" (Zool. anzeiger, 8 Jan. 1883, v. 6, p. 21-22). *B: P. M.* (4267)

Scudder, S: Hubbard. Early stages butterflies wanted. (Psyche, 1883, v. p. 2, 22, 42, 62, 82, 102, *each* 4 cm.)

Advertisement; same as Rec., 3085. *B: P. M.* (4268)

ENTOMOLOGICAL ITEMS.

APICAL APPLICATION OF APIS. "Sir John Lubbock says bees are not sympathetic. It may be stated, accordingly, that the warmth of their reception doesn't come from the heart."

PRIZE WORK ON TACTILE ORGANS. The French academy, on 21 Dec. 1885, granted the grand prize for anatomical and physiological research to Dr. Joannes Chatin, for his work (not yet published) on the tactile organs of insects and crustacea.

TENACITY OF LIFE IN CALLIPHORA VOMITORIA.—At the meeting of the Société entomologique de France, 8 July 1885, as reported in its Bulletin, Mr. Paul Audolent remarked that he had lately had an opportunity of proving the vital power of larvae of *Calliphora vomitoria*. Many of these larvae, which he had given as food to tritons, remained alive two days at the bottom of the water, and in fact pupated there. He had collected these pupae to see if they would reach the perfect state.

BIRDS NESTING IN HORNETS' NESTS.—In a letter to *Nature*, 12 March 1885, v. 31, p. 438, on birds nesting in ants' nests, Mr. W. Davison says of *Halcyon chloris*, a species of kingfisher, which also nests in ants' nests:

> At Mergui, in South Tenasserim, I found a nest of *H. chloris* in a hornets' nest, and although I saw the birds repeatedly enter the hole they had made in the hornets' nest the hornets did not seem to mind it, but they resented in a very decided manner my attempt to interfere with the nest.

LIFE OF DR. DZIERZON.—Dr. Oskar Krancher contributes to the *Deutscher bienenfreund* for January 1885, an account of the life of Dr. Johann Dzierzon, well-known for his contributions both to the theory of bee-life and to practical apiculture. Dr. Dzierzon, or as he was commonly designated, Pastor Dzierzon, was born 16 Jan. 1811, in Lowkowitz, near Kreuzburg, Upper Silesia. Shortly after finishing his studies at Breslau, he became, in 1835, pastor in Karlsmarkt, near Brieg, in Silesia, where he remained until lately, having just returned to live in the town where he was born.

STRUCTURE OF EYES OF DIPTERA. Professor C. V. Ciaccio, of Bologna, published in the last volume (ser. 4, v. 6, fasc. 1) of the "Memorie della R. accademia dell' Istituto di Bologna" a series of excellent illustrations of the minute structure of the eye of diptera. The paper, published under the title of "Figure dichiarative della minuta fabbrica degli occhi de' ditteri," consists of twelve large plates with explanatory text (28 pages), and gives microscopical details (enlargement from 190 to 410) of eyes of *hippoboscidae*, *oestridae*, *syrphidae*, *muscidae*, *empidae*, *leptidae*, *asilidae*, *bombylidae*, *tabanidae*, *chironomidae*, *tipulidae* and *pulicidae*.—*Entom. nachrichten*, May 1885, jahrg. 11, p. 144.

STRUCTURE AND HABITS OF OEDEMATOPHAGA AEGUSALIS. E: MEYRICK (Trans. Entom. soc. Lond., 1884, p. 73-74) makes a new genus, *Oedematophaga*, for *Pyralis aegusalis* Walk., "correcting" the specific name *aegalis*. *O. aegusalis* is a curious insect, having as one of its generic characters "Anterior femora in male with an expansible tuft of hairs," a character recalling a peculiarity of certain species of *Catocala*. The larvae feed gregariously "in large, very irregularly spherical, rough galls, three or four inches in diameter, on the branches of a phyllodineous *Acaeia*," . . . "the larva eats galleries through the substance of the galls, ejecting a good deal of the excrement from holes in the surface.

DIPTEROUS PARASITE OF THE RHINOCEROS.—Dr. Friedrich Brauer describes and figures in the Verhandlungen der zoolog.-botanischen gesellschaft in Wien (1884, v. 34, p. 269-271, pl. 10) the larva of a new genus and species of *oestridae* from the stomach of *Rhinoceros sumatrensis*. The larva differs strikingly from that of *Gastrophilus* in having the arcades of the posterior stigmata forming on each side three bands,

curving in zigzag, and not three concentric semicircles, from which peculiarity the author has given the insect the generic name *Gyrostigma*. The entire larva, the mouth-parts, and posterior stigmata of *G. sumatrensis*, the new species in question, are figured.

POSTURE OF NEWLY EMERGED BUTTERFLIES.—Mr. Joseph Anderson called attention, several years ago, in the *Entomologist*, to "a singular habit of *Apatura iris* upon emerging from the puparium,—to wit, its clinging to the empty case with the head uppermost for five or six hours, and then reversing the position (still keeping hold of the chrysalis) and remaining with head down and wings upward for a similar time." Since that time Mr. Anderson has learned from Mr. F. N. Pierce, of Liverpool, that *Vanessa polychloros* has a similar habit, except that it leaves the pupal case and clings to a branch. In a note in the *Entomologist* for September 1885 (v. 18, p. 241-242), Mr. Anderson asks the reason for this curious habit of two butterflies, which thus differ in habit from *Vanessa io*, *V. urticae*, *V. cardui*, and *Erebia medea*.

EROSION OF GLASS. — Under this title William M. Ord communicates to *Nature*, 19 Feb. 1885, v. 31, p. 360, the results of some experiments upon the erosion of glass by alkalies in connection with colloid substances. These experiments were undertaken with especial reference to the question of how "white-ant mud" was capable of eroding glass. Mr. Ord thinks that "the white-ant mud must consist of a mixture of some colloid with carbonate of lime or some other salt capable of taking spherical form." In conclusion he adds, as a result of his experiments, "It suffices, at the moment, to indicate that the surface of a glass slide may be eroded in a way to suggest the action of an acid, such as hydrofluoric acid, when no free acid is present; and that erosion may occur when the glass is brought in contact with alkaline fluid, a colloid, and crystalline substances capable of assuming, in the presence of a colloid, spheroidal form."

EUDAMUS TITYRUS FLYING AT NIGHT.—On the evening of 5 Aug. 1885. at 9 h. 30 m., I removed a mosquito netting from a window near which I was sitting, to close the window for the night, when a butterfly flew in. It fluttered very little in the room, and supposing it to be a moth I paid no particular attention to it at the moment. About ten minutes later, however, happening to approach the gas chandelier, I saw the butterfly suspended to one of the screws holding a glass globe around one of the gas-jets. It was stationary, but frequently uncoiled its tongue so that only the tip remained between the palpi, and then slightly coiled and uncoiled it so as to rub the tip between the palpi. It would suddenly coil the tongue up completely, and then soon resume the former motion. Upon my attempting to capture it, after watching it some time, it uncoiled the tongue so as to free the tip completely from the palpi, and then beat against the globe as a moth would to get at the flame. Finally it got inside the globe and scorched its wings and fell to the floor, but fluttered frantically when I tried to pick it up. It proved to be *Eudamus tityrus*, and is sent herewith.—*B. Pickman Mann*, at meeting of C. E. C., 11 Dec. 1885.

PARASITES NEMATODS.—M. Henri Gadeau de Kerville, at the meeting of the Société entomologique de France, 9 Sept. 1885, reported the finding of three species of nematods in arthropods, which are interesting additions to the lists of arthropods in which parasitic vermes have been found. The species of nematods were determined by A. Villot, of Grenoble, as follows: *Gordius emarginatus* Villot, of which the determination is doubtful because the caudal extremity of the specimen was partly hidden in the digestive tube of a *Lithobius forficatus*, its host, from which M. Villot did not wish to completely extract the worm; *Mermis acuminata* Siebold, from a larva of *Ypsipetes sordidata* Fab.; and

Mermis nigrescens Dujardin, of which a young individual was taken from a larva of *Hybernia defoliaria* L. *Gordius* has not been known hitherto as a parasite of a myriopod.

In this connection attention is called to a work on these parasites, which seems to be little known in America. This is Linstow's Compendium der helminthologie .... 1878 [Rec., 3119], in which one is able readily to trace the literature of most species of parasitic worms if either the name of the host, whether vertebrate or invertebrate, or that of the parasite is known.

TOMATO-PLANTS AS REPELLANTS OF INSECTS.—According to the *Colonial mail*, a statement comes from the Cape Colony which is deserving the attention of botanists. It is alleged that insects shun the land on which tomatoes are grown; and the cultivation of the *Lycopersicum esculentum* is accordingly recommended in all cases where it is possible to grow it—under fruit trees, for instance, since the tomato will thrive in the shade of other trees, which few other plants will do—for the sake of the virtues attributed to it as prophylactic against the inroads of insect pests. It would be interesting to know whether the tomato has been observed to exercise any such effect upon insects elsewhere—in Canada, for instance, where the fruit is so popular—or whether it is only in warmer climates, like that of the Cape, that its peculiar powers are brought into play.—*Nature*, 1 Jan. 1885, v. 31, p. 202.

It may be sufficient to state that the use of tomato leaves as repellants of insects was recommended in France and in the United States at least as long ago as the year 1846, but that experiments properly made have shown the inefficacy of the remedy. The roots, stems, leaves and fruits of this plant are eaten by numerous species of insects. There is no reason to suppose that the Cape Colonists are any less ready than their northern relatives to jump to the conclusion, on insufficient grounds, that because a plant has certain qualities noxious to man, it is therefore also noxious to insects.

FOSSIL THYSANURA. — At the meeting of the Société entomologique de France, 27 May 1885, as reported in its Bulletin, Mr. C: Brongniart made the following communication:

"Claus places the thysanura among the orthoptera; they are generally considered to be the primordial type of insects. No one has recorded them from the paleozoic strata.

"Nevertheless they existed as early as the coal period, for forty-five specimens have been found in the schists of Commentry. It is difficult to see the number of joints of the tarsi, palpi and antennae, but these organs are distinguishable on many specimens. The body is cylindrical, slender at the posterior part, and ends in a multiarticulate filament as long as the body. The antennae and tarsi are thickish. The head appears quite broad. The prothorax is very short, and the mesothorax and metathorax are equal in length and much longer than the prothorax. The abdomen has ten segments, equal among themselves; the terminal one, which bears a multiarticulate filament, is a trifle the longest. There seemed to me to be abdominal laminations upon one of the specimens, as there are in *Machilis*. The whole animal (antennae, feet, thorax, abdomen) is clothed with very thick and very short hairs. The body, including the abdominal filament, varies in length between 15 and 22 mm.

"This insect resembles morphologically *Lepisma* and *Machilis*; it differs from them by many characters, but principally in the presence of a single abdominal filament in the fossil form.

"I designate this ancestor of the living thysanura under the name of *Dasyleptus* (*dasys leptos*) *lucasi*, dedicating it to Mr. Hippolyte Lucas, of the Natural history museum of Paris."

ON CARRYING HIBERNATING LARVAE THROUGH THE WINTER.—I have sometimes so carried larvae in ice boxes, or in ice

houses, or in snow banks, by aid of friends in the northern states mostly, but last fall I heard of a large room called a "cooler" at the Sanitarium at Clifton Springs, New York, in which meat and vegetables are kept, the temperature averaging 40° F. all the year, and my application for a little space was kindly received. In October, I sent on two boxes by express, in which were a large number of larvae, some of them very rare. Of these were *Argynnis halcyone*, just from egg; *Satyrus charon*, also just out of egg. These small larvae were in paper pill boxes, inside tin. There were also a few larvae of *Chionobas chryxus*, *Hip. ridingsii*, *Colias alexandra*, *Phyciodes picta*, in stages from second to fourth; and several *Melitaea ruibcunda*, past third moult from Vancouver's Island, and [*M.*] *phaeton* at same stage. Early in March I received the larvae per express. On opening the box nearly every one of the young larvae first named were alive, and in a few moments were moving. The larger part of *rubicunda* and *phaeton* were in good condition. One *alexandra* out of two was healthy, and one *picta* out of three. The *chryxus*, past third molt (one), and the *ridingsii*, past first (one), were dead. On the whole, there was scarcely any loss from the four months seclusion. The *Chionobas*, I am disposed to think, died in transit to me, from rolling about in its box, as it was stout and healthy looking when I received it. Probably all the satyrid larvae would have done better if they had not been allowed to feed in the fall, but had on hatching been subjected to the cold. I had no plants ready for these larvae on their arrival except grass, and on this I placed part of the *charon*, who very soon began to eat along the edges of the leaves. The remainder of all species I put on ice, or under rocks in the woods, to stay till I could force food-plants for them.—*W. H. Edwards* (Can. entom., June 1885, v. 17, p. 113-114).

ANATOMY OF MACROTOMA PLUMBEA. — "Ueber *Macrotoma plumbea*. Beiträge zur anatomie der poduriden" is the title of a 46-page inaugural dissertation, by Albert Sommer, from the Göttingen university, also published, with a plate, in the *Zeitschrift für wissenschaftliche zoologie*. The author studied carefully the histological structure of the ventral tube with its pocket-formed, evaginable lobes for attachment of the insects to objects beneath them, and finds that unicellular glands furnish the tube with the secretion necessary for attachment, and make it a remarkably good adhering organ that enables the little animal to move on vertical smooth surfaces. The egg is formed, by the union of yolk-substance, from an aggregate of cells at first of uniform shape which have their origin in the germarium; a germinal vesicle is lacking; a condition which calls to mind the eggs of viviparous dipterous larvae studied by Ganin. The observation is interesting that even the adult insects still molt every two or three weeks. In molting the old hairs are stripped from the new layer of skin; the scales, on the other hand, are shed without connection with the new ones. A gregarinid occurs as an almost constant parasite in the chylific ventricle; outside the digestive tract occur pseudonavicellae, cysticercae similar to those described by Stein from the digestive tract of *Tenebrio molitor*, and nematods rolled up spirally. It would have been better to have replaced the name *Macrotoma*, used in the *cerambycidae* since 1832, by *Tomocerus* Nicolet 1841. — *Entom. nachrichten*, July 1885, jahrg. 11, p. 221-222.

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0. GENERAL.

01. BIBLIOGRAPHY.

Importance, 4215, 4227. Principles, 3306. Dates, 4222. Use of catalogs, 4087.

011. General bibliographies, 4233.

012. Bibliography of special authors [*see also* **018.** Author catalogs], 3270, 4098.

Binney, 3975. Bland, T:, 3975. Kiesenwetter, 3166. Leuckart, 4109. Löw, H., 4027. McCook, 4074. Rondani, 4023-4024, 4026. Say, 4160. Yersin, 3291 *w*.

014. Bibliography of special forms.

Anonyms [*omitting those from* 3162 *to* 3211, *and from* 4058 *to* 4300], 3102, 3126, 3144, (3359), 3361, 3492-3493, 3517, 3523, 3529, 3722 (4219), 3758, 3766, 3836, 3875-3876, 4010.

Indices. Linstow's Compend. d. helminthologie, 3119. Mann's Index to entom. liter., 4226-4227. Mann's Ref. indexes, 4233. Repts. State entom. Mo., 3290. 2d rept. U. S. entom. comm., 3291 *x*.

016. Bibliography of special subjects (*see also* **011**).

016, 5. Science, 4141.

016, 579. Collecting, 3772.

016, 59. Zoology, 4215.

016, 591, 1. Physiology. Locomotion, 3939. Luminosity, 3589.

016, 591, 2. Pathology. Parasites, 3364, 3569.

016, 591, 3. Embryology. Adolescent states, 3145, 3290.

016, 591, 5. Biology, 3416, 3536. Entomoccidia, 3416, 4177, 4230. Migrations, 3291 *d*. Oviposition, 3520.

016, 591, 6. Economic zoology. Orchard pests, 3752.

016, 591, 7. Anatomy: of glands, 3734; of olfactory organs, 3872; of anal appendages, 4061; of scales, 4119; of lampyridae, 3589.

016, 591, 8. Histology: of brain, 3291 *l;* of dorsal vessel, 3729; of hexapoda, 3291 *k*.

016, 591, 9. Faunae: of Europe, 3145, 3999, 4141; of North America, 3270, 3723, 3948.

016, 595. Entomology, 3316, 3651-3658, 4214 (4215), 4226-4227.

016, 595, 1. Vermes, 3119, 3569.

016, 595, 4. Arachnida. Demodex, 3823. Hydrachnidae, 3999. Theridiidae, 3723. Epeiridae, 3948. Solpugidae, 4104.

016, 595, 7. Hexapoda, 3300-3303, 3306, 4023-4024, 4026-4027, 4101. Acridiodea, 3291 *d, s,* 3487. Corydalus, 4140. Rhynchota, 3600, 3703, 3752, 3755, 3926. Coleoptera, 3145, 3416, 3589. Diptera, 3519-3520, 3536. Crambus, 3334. Hymenoptera, 3790, 3793, 3901.

016, 91. Geography. Cassel, 4141.

018. Author catalogs (*see also* **012**), 3145.

Abbot, P. S., 4087. Ackermann, (4141). Adolph, 3101. Albrecht, 3186. Allen, G., 3190. Anderson, J., jr., 3103-3104, 3675-3676, 3885, 4063. Anderson, T. J., 3591. André, E., (4139), 4149. Andrews, 3592-3593. Angas, 4299. Angus, 4064. Anthony, 3595-3596. Apgar, A. C., 4066. Arms, J. M., (4142). Arnhart, 3597. Arribálzaga, (4275). Ashmead, 3105-3116, 3598-3600, 3886. Aubert, (4068). Audolent, 4069. Aurivillius, 4070, (4110). Austin, E: P., 3601-3603, (4098). Austin, R. M., 3604. Axon, 3505.

Bachmann, 3235. Bacon, G. W., 3190. Bacon, W. D., 3605. Bailey, J. S., 3606, 3887. Baird, 3160. Balbiani, 3788. Balding, A., 4141. Balding, G:, 3607, 3677. Barbier, 3608. Barbour, 3609. Bargagli, 3610. Barlow, J. G., 3402. Barlow, T:, 3611. Barnard, G:, 3888. Barnard, W: S., 3506, 3612-3620, 3628, 4071, 4073. Barnes, H., 3414. Barrett, 3236, 3503, 3621, 3889 (4228), 4072. Barricelli, (4141). Bassett, 3354-3356, 3357 (3416, 3501), 3622-3623, 3890. Bassnett, 3670. Bates, H: W., 3624. Beauregard, (4154). Beijerinck, 3891. Beling, 3625. Bell, J. T., 3237, 3892. Bennett, 4191. Berg, 3238, 3626-3627, (4136). Bergroth. 3239. Berlese, 3893. Bertholet, 3240. Bertkau, 3678. Bessey, 3679 (3754). Bethune, 3241, 3628. Bettany, 3894. Bieler, 3242, 3292. Bigg-Withers, (3765). Bigot, (4297). Billups, 4147, 4149. Birò, 3895. Blanchard, F:, 3896. Blaney, 3629. Boden, 3293. Bogomolow, (4234). Boisduval, 3842. Borgmann, 3294-3295. Bourne, 3877. Bowditch, 3630. Bowles, W:, 3291 *u*. Brandt, 3358. Brauer, 1855 (3455), 3631. 3897 (4141), 4075, (4121). Breitenbach, 3898. Brewer, 3781. Briant, 4193. Briggs, 3680. Brinton, 3165. Britton, 4272. Brongniart, 3681, 4076, (4087). Bronn, 3720. Broun, (4134). Brunner von Wat-

tenwyl, 3632. Brush, 3633. Buckler, 3456, 3634-3635. Buckton, 3636, (4083). Buel, 3899. Burgess, 3274, (4061), (4098). Burton, (4093). Bush, A. E., 3284. Bush, I., 3637. Butler, 3226, 3243-3246, 3638, 4149, 4299. Butlerow, 3285. Buzek, 4143.

Cambridge, 3172, 3286, 4299. Camerano, 3682. Cameron,—, (4093). Cameron, P:, 3457, 3639-3640, 3900-3901. Campbell, G: D., 3902. Campbell, F. M., 4193. Campbell, J. M., 4190, 4192. Candèze, 3641-3642, 3683. DE Candolle, A., 3190. Carlet, 3320, 3684, 3685 (4089). Carrington, 3171, 3174, 3190, 3192-3193, 3196, 3204, 3643, 3933. Carus, 3190. Chambers, 3297, 3686-3687, 3903-3913, 4091. Champion, 3458, 4149. Chapin, 3705. Chapman, A.W., 3688. Chapman, I:, 3689. Chatin, 3789. Cheshire, 4149. Child, 4087. Cholodkowsky, 3690. Chun, 3190. Chretien, 3914. Christy, 3645, 4172, 4191, 4193. Ciaccio, (4279). Claparède, (3999). Clark, (4139). Clarke, 3915. Claypole, 3359. Clemens, 3691-3699, (3910), 3916. Clement, 3162. Clements, 3917. Clifford, 3918. Cobbold, 4191. Cockerell, 3919-3920. Coleman, 3921-3923. Collier, 3360=3507. Comber, 3924. Comstock, J: H:, 3247, 3508 (4231), 3628, 3700-3714, (3763), 3925, 4094. Cook, 3926-3927, 4095, 4294. Cooke, E:, 3298, 3928. Cooke, M., 3705. Cooper, 3929. Cope, 3930. Coquillett, 3212, 3719, 4096. Corbett, 3299. Cornelius, (4165). Corning, 3931. Couper, 3932. Coverdale, 3933. Cox, E: W., 3934. Cramer, A. W. P., 3935 (4132). Cresson, 3790-3822. Cressy, 3569. Crotch, 3213. Csokor, 3823.

Dahl, 3824-3826, 3937, 4097. VON Dalla Torre, 3300-3303, 3306. Danielson, 3716. Darwin, C:, 2377 (3680), 2378 (3720, 3725), 2369 (3743-3744). Davis, W: T., 4100. Davison, 4099. Deane, 4142. DeGarmo, 3827. DeGrey, (3259), 3332, 3938, 4193. Delpino, 3562. Délugin, 4139. Dewitz, 3828, 3939-3940. Dimmock, A. K., 4087, 4101 (4083), 4102. Dimmock, G:, 2985 (3675, 3677), 4078-4087, 4103-4118, 4119 (4079), 4136, 4229, 4244. Distant, 4122-4123, 4149. Dixon, 4272. Dobson, 3304-3305. Dodge, C: R., 4124. Dohrn, C. A., 3170, 3182. Dollfus, 4138. Donckier de Donceel, (4142). Dorfmeister, 3829. Doubleday, E:, (3850). Douglas, 3509 (3514). Druce, 3830, 4299-4300. Dubois, A., 4125. Dubois, R., (4068). Du Bose, 3831. Dury, 3203, 3270, 3832. Dwight, 3833. Dyer, 3190.

Eaton, A. E., 3459, 3834, 3941, (4086), 4191. Edes, 3835. Edwards, H:, 3190, 3215-3218, 3248-3251, 3255-3256, 3646. Edwards, W: H:, 3214 (4052), 3252-3254, 3257-3258, 3274, 3647-3649, 3688, 3837-3861, 3942-3946, 4048, (4081), 4126. Ekelberg, 3947. Elwes, 4149. Emerton, 3723, 3948. Emmerig, 4260. Enock, 4149.

F———, J., 3194. Farn, 3362. Fauvel, 3363, 3651-3658. Fay, H. T., 3952. Felissis-Rollin, 3168. Fernald, C: H:, 3219, 3259, 3953-3956, (4139), 4152. Fischer, E., (4073). Fischer, P., 3957. Fitch, A., (3219), (3910), (4199). Fitch, E: A., 3364-3365, 4149. Fletcher, J., 3724 (3728). Fletcher, J. E., 3460. Flower, 3181. Foerste, 3551 (3564), 4078, 4081. Forbes, H: O., 3958. Forbes, S. A., 3407, 3747, 3959-3962, 4155-4156. Foster, 3187. Fournié, 3190. Fournier, 3725. Fowler, 3366, (4130), 4157. French, 3220, 3260-3263, 3367, 3863-3864. Frenzel, 3510. Frey, 3368. Friedländer, 4158. Frost, 3369. Fuchs, 3963. Fuller, 3964. Fyles, 3726 (3759), 3727 (3724), 3728, (3761), 3965.

Gadeau de Kerville, (4247). Gamgee, 3187. Gardner, 3370 (3423). Geikie, 3190. Gentry, 3966. Gerard, 3967. Gerber, 3406. Gestro, 4143. Giard, 3968. Gibbs, 3371. Girard, 3163, 3969. Giraud, 3372. Gissler, 3555, 3970-3974. Glover, (3570). Goding, 3865-3866. Godman, (4122), 4299-4300. Goodale, 3562. Goossens, 3461. Gosse, (4082). Gould, J: S., 3716. Graef, 3432. Grassi, (4138). Gray, A., 3190, 3373-3376, 2410 (3741). Gray, A. F., 3975. Greene, 3976. Gregson, 3977. Griffith, 3187. Grote, 3221-3225, 3264-3267, (3332), 3659 (3594), 3867-3868, 3978-3997, 4048, (4091), 4149, (4159). Guillebeau, 3869, 3998. Gundlach, 3268.

Hagen, 3226, 3306 (3300-3303, 4026-4027, 4215), 3378 (3412, 3424), 3462, 3480, 3728, 4084, 4086, (4133), 4160-4163. Haldeman, 3511. Haller, 3999. Harding, 3379-3380. Harrington, W: H., 3660-3661, (4136). Hart, C: H:, 3165. Hart, T. H., (4252). Hayward, 4000-4003, 4081-4083, 4086. Hazlewood, 4164. Heartt, 3899. Hellins, 3383-3385. Henking, (4078). Henry, 4004. Hinckley, 4166. Hinkley, 4086. Hitchings, 4149. Hoffmeister, 3386. Horn, 3117, 3387, 3463, 3870, 4005-4006, 4058. Horner, (4252). Howard, L. O., 3310, 3332, 3336, 3348, 4167-4168. Howgate, 4169. Hubbard, E. S., 3569. Hubbard, H: G., 3291 *n*, 4170. Hudson, 4007, 4171. Hutton, 4134. Huxley, 3190.

Jack, 4078, 4174. Jacobs, (4139), (4257). Jaeggi, 3183. Jaworowski, 3388, 3729. Jenkyns, 3389-3390, Johnson, S. W., 3716. Jones, E. D., 4175. Jones, E. H., 3391-3392. Jones, W:, (4136). Jordan, 4176. Jousset de Bellesme, 3393-3395.

Kane, 3464. Karpelles, 4008. Karsch, 4177. Kellicott, 3269, 3465, (4201). Kent, 4178. DE Kerchove de Denterghem, 3466. Keyserling, 3730-3733, 4009. Kingsley, 3871, 4142. Kirby, W:, (3241). Kirby, W: F., 3274, (4113), 4149, (4277). Klemensiewicz, 3734. Kliver, (4086). Kohl, 4011-4012. Kraatz, 3166. Krancher, O. P., 4179, (4189). Kraepelin, 3467, 3872. Krause, (4236). Krauss, 4180. Kreithner, 4013. Kriechbaumer, 3873. Krukenberg, 3468. Künckel d' Herculais, 3735, 3874. Künstler, 3736.

Laboulbène, 3372, 3737, (4120). Ladd, 4087. La Munyon, 3469-3470. Landerer, 4181-4183. Landwehr, 3878. Lange, 4184. Lankester, 3471, 3877, 4300. La Salle, 3879. Layet, (4138). Leconte, 3118, 3512, 2888 (3892), (4168). Lefèvre, (4185). Leidy, 3513, (4187). Lendenfeld, 4188. LeRoy, 3190. Leuthner, 4300. Lewis, G., 4149. Lichtenstein, 3472. Lintner, 3120-3121, 3271-3272, 3473-3474, 3594, 3628, 3650, 3663, 3862, 3950, (4103), 4196-4202, 4244. Linstow, 3119 (4247). Llewelyn, 3475. Locard, 3168. Lockwood, 3122. Looss, 4204. Löw, F., 4014, 4203. Lowne, 3880, 4205. Lubbock, 3434-3438, (4146). Luchsinger, 3869. DE Lucretiis, 3291 *u*. Ludwig, 3476. Lugger, 4206, 4207 (4262). Lyman, J. B., (3570).

Mabille, 3164. McCook, 3477, 3894, 4058. McDonald, 3478. McLachlan, (3317), 3479-3483, 3514, 3515 (3509), 3738 (3419=3760), (4074), (4140), 4149. Macleay, 4194, 4208. MacLeod, 3881, 4016-4019. Macloskie, (4141), 4209-4210. McMurrick, (4141). M'Rae, 3484-3486. Machleidt, 4015. Maggiorani, 3190. Mann, B: P., 3291 *s*, 3487, 4075, 4078, (4084), (4086), 4087, (4098), 4136, 4142, 4177, 4212-4233, 4244. Mantegazza, 3190. Mark, (4098). Maren, 3291 *r*. Martin, L. J., (4141). Martini, 3488.

Marx, 3123. **Maskell**, (4144). **Maus**, 3227. **Mead**, 3124. **Meade**, 3516. **Meehan**, 4058. **Mégnin**, 3768. **Meinert**, 3489. **Melchert**, 3490. **Meldola**, 4149. **Mellichamp**, 3322. **Melvill**, 3491. **Meyrick**, (4278). **Michael**, 4192. **Mik**, 3396 (3404-3405). **Milizia**, 3291 *u*. **Minà-Palumbo**, (4142). **Minot**, 3291 *k*, (4141). **Möller**, 3397 (4218). **Möschler**, 3494-3498, 4020. **Moffat**, 3127-3130. **Mojsisovics**, 3131. **Moleschott**, 3190. **Morris**, J: G., 3132 (3125). **Morrison**, 656 (4061). **Moseley**, 3133, 3206, 3664. **Muellenhoff**, 3739. **Müller**, F., 3443, 4444 (3519), 3740, 4149, 4235. **Müller**. H., 3134, 3439-3440, 3552, 3562, 3564, 3741-3744. **Müller**, W., 3745. **Munn**, 4237-4238. **Murie**, 4192-4193, 4205. **Murray**, W:, 3135. **Murtfeldt**, 3499, 4239-4240. **Myer**, 3291 *t*. **Myers**, 3136.

Neumoegen, 3228-3229, 3273, 3287. **Nordenskiöld**, (4110). **Norton**, J., (4142). **Nusbaum**, 3500.

Olliff, 4149. **Ord**, 4245. **Ormerod**, 3441, 4149. **Osborn**, H., 3746-3756, (4104). **Osborn**, S. D., 4272. **Osborne**, 3518, (3523). 3757, 4021, 4022 (3523), 4246. **Osten Sacken**, 3398-3401, 3408, 3443, 3519-3520, (3622), 4023-4027, (4096), (4142).

Packard, 3137-3139, 3291, 3338 (3344), 3442, 3521, 3665-3666, (3910). **Palmer**, 4195. **Parfitt**, 3522. **Pascoe**, 4149. **Passerini**, 4248. **Pasteur**, 3362. **Patton**, 3444, 4028, 4149, 4249. **Peach**, 3524 (4080). **Peal**, 4029-4030. **Peck**, C: H., 4141. **Peringuey**, 4147. **Peters**, (4136). **Petiver**, (3226). **Pierce**, 3525. **Pike**, 3526. **Plateau**, F., (4087). **Plowright**, 3527. **Poisson**, 3528. **Porter**, (4135). **Poujade**, 4253. **Poulton**, 4031. **Preud'homme de Borre**, (4006). **Proost**, 3190. **Pütt**, (4138).

Quatrefages, 3190.

Ragusa, 3140-3141. **Ramsay**, 4195. **Ratte**, 4195. **Rauwenhoff**, 3190. **Reed**, 3142, 3663, (4108). **von Reizenstein**, 3143. **Reuter**, 3445. **Ribeaucourt**, 3530. **Richardson**, 4272. **Ricksecker**, 4039. **Riggs**, 3716. **Riley**, —, (4254). **Riley**, C: V., (3267), 3288, 3290-3291, 3307-3336, 3339-3353, 3402-3404, 3409-3429, 3446-3454, 3501, 3516, 3531-3534, 3535 (3506), 3536 (3520), 3547-3550, 3554, 3570-3584, 3612, 3667 (3594), 3668 (3647), 3670, 3705, 3748, 3754, 3759-3761, 3770, 3835, 3882, 4073, (4135), (4141), 4143, 4149, 4186, 4261-4263, (4288). **Robineau-Desvoidy**, (3968). **Rogenhofer**, 4020. **Rolfe**, 4193. **Romanes**, 3190. **Ross**, 4264. **Roth**, A. W., 3537. **Roth**, H. L., 4193. **Rüst**, 3538. **Rupertsberger**, 3145. **Rye**, 4265.

Sallé, 3173. **Salvin**, (4122), 4299-4300. **Sandahl**, 3211. **Sang**, 3539. **Saunders**, E:, 3502. **Saunders**, S. S., 4149. **Saunders**, W:, 3146-3150, 3540, 3628, 3726, 4032, (4196). **de Saussure**, 3291 *w*. **Say**, 3430-3431, 3899, (4160), (4168). **Schaafhausen**, 3190. **Schaitter**, 4033. **Schaupp**, 4034-4040, (4186). **Schiemenz**, 3337 (4118). **Schilde**, 3151, 3762 **Schletterer**, 4041. **Schmeideknecht**, 3766. **Schneck**, 3426. **Schneider**, A., (4133). **Schneider**, F. E. R., 3230. **Schoch**, 4042. **Schönfeldt**, 3153. **Schofield**, 4139. **Schrœder**, 3231. **Schulgin**, 4267. **Schwarz**, 3309. **Scott**, 4083. **Screven**, 3336 (3348). **Scudder**, 3274 (3258), 3275-3277, 3291*q*, 3541-3542, 3628, 3710, 3763, 3951, 4078-4083, 4085-4087, (4098), (4142), 4268-4270. **Sedgwick**, 3569. **Serpin**, 4271. **Sharp**, 4043, 4147, 4149, (4287). **Shimer**, 3553, 3554 (3584). **Sicard**, 3190. **Siewers**, C: G., 3543, (4061). **Simmonds**, 3152. **Skinner**, 4058. **Smith**, Emily A., (3219), 3663, 3669 (3594), 3670. **Smith**, F., (3812, 3815-3817). **Smith**, J: B., 4044-4046. **Smith**, S. I., 3716. **Smith**, T. B., (4135). **Snow**, 3965, 4047-4049, 4272 (4297), 3092 (4288). **Sograff**, 3764. **zu Solms-Laubach**, (4131). **Sommer**, (4062). **South**, 3765. **Spängberg**, 3195, 3278-3281. **Speyer**, 3154, 3274, 3277. **Spiller**, (4117). **Spofford**, 3291 *u*. **Sprague**, F. H., 4274. **Sprague**, I:, 3562. **Stainton**, 3210, (4133). **Stanley**, 3544. **Stebbins**, S., 4276. **Stein**, 3155. **Stevens**, 4194. **Stevenson**, W. G., (4142). **Stillman**, 3555 (3974). **Strecker**, 2733 (3124), 3156, 996 (3965), 4277. **Stretch**, 3282, (4061). **Suffrian**, 3671. **Syme**, 3545.

Tallant, 3157. **Tasker**, 3556. **Taylor**, T:, 4073. **Tepper**, F:, 3432, 4050-4052. **Tepper**, J. G. O:, 4191. **Thaxter**, 4078. **Thomas**, C., 3291. **Thomas**, F. A. W., 4162. **Thomson**, 3190. **im Thurn**, (4265). **Tilghman**, 3557. **Todd**, 3158-3159, 3558. **Tommasi**, 3190. **Tömösváry**, 4282. **Townsend**, 3559, 3672, 4283-4284. **Treat**, 3340, 3560-3561. **Trelease**, 3289, 3551, 1794 (3552), 3562-3564, 3673, 4078, 4286 (4162). **Tribolet**, 3184. **Trimen**, 3767 (4123). **Troop**, 3565. **Trouessart**, 3768. **Trouvelot**, 3674. **Tyrrell**, 4053.

Verrill, 3566-3569. **Vogel**, (4256). **Voges**, 4054.

Wailly, 4149, 4290. **Walker**, J. J., 4291-4292. **Wallace**, 2362 (3742). **Walsh**, 3349-3353, 3452-3454, 3546-3550, 3553-3554, 3570-3584, 3769-3770, 3882. **Ward**, (4254). **Warder**, 3308. **Waterhouse**, 4293. **Watson**, 3585. **Websdale**, 4055. **Webster**, F. M., 3586, 3771, 4056. **Weidinger**, 3161. **Weir**, 3772-3776, 4172, 4191. **Weismann**, 3587 (3437). **Westhoff**, 3777. **Westwood**, 4149. **Wetherby**, 3659 (3594), 3663. **Weyenbergh**, 3778. **Weymer**, 4057, (4165). **White**, W. W., 3716. **Whitney**, 3588. **von Wielowiejski**, 3589. **Wilkinson**, C., 3503. **Wilkinson**, C. S., 4195. **Williams**, 3190. **Williston**, 3232-3233, 3779-3784, 4272, 4295-4297. **Wilson**, O. S., 3785. **Witlaczil**, 3504, 3590. **Wood-Mason**, 4149, 4298, 4300. **Worthington**, 3234, 3433, 3786, 3883. **Wright**, W. T., 3787. **van der Wulp**, 3405.

Zacharias, 3190. **Zeiller**, 3884. **Zuber**, (4257).

025. Library administration. Books for sale, 3651-3658, 4139, 4158. Books wanted, 4142. Prices of books, 4123.

04. POLYGRAPHY.

Extracts, notices and reviews. (*See references in parentheses under authors, periodicals, and society publications.*)

06. GENERAL SOCIETIES.

Académie de France, 3968. Peabody museum, 4289. Royal society of Tasmania, 4178.

1. PHILOSOPHY.

124. Teleology. Beauty, 3924.

17. ETHICS.

174. Professional ethics, 3968.
178. Temperance, 4183.

2. RELIGION.

220,859. Bible zoology. Leviticus, 4008.

3. SOCIOLOGY.

32. POLITICAL SCIENCE.

325. Immigration, 3291 *c*.

34. LAW.

343. Criminal law. In Great Britain, 3359.
347. Private law treatises. U. S. postal laws, 3925.

35. ADMINISTRATION.

Administrative measures against agricultural pests, 3291 *o*, 3359, 3466, 3641-3642, 4251.
353. United States institutions. U. S. Department of agriculture, 3710, 3976, (4130), (4136), 4143. U. S. Entom. comm., 3290 (3288), 3291 (3536), (3307), 3976. U. S. National museum, 3160, 3710.
353,9. State institutions.
353,974, 7 New York. N. Y. State mus. nat. hist., (4103).
353,977,3. Illinois. Ill. State lab. nat. hist., 3407.

37. EDUCATION.

370,6. Societies. Mass. teachers' assoc., 4142.
378. Colleges and universities. Cornell univ., 3508, 4153.

38. COMMERCE.

389. Metrology, 3509, 3514–3515.

4. PHILOLOGY.

47. Latin. Celtis, 3728, 3761.
492,. 4. Hebrew. Names of animals, 4008.
496 African languages. Niyanja Muta Nzige, 3544.

5. NATURAL SCIENCE.

504. Lectures, 3438, 4158.
505. Periodicals, 4243.
505, 4. European. Bull. del nat. collectore, 4077. Feuille d. jeunes nat., 4106-4107. Natura, 4132. Pract. nat., 4264.
505, 7. North American. Kansas City rev., 4135. Nat. can., 4136. Sci. rec., 4142.
506. Societies.
506, 42. British, 4134, 4138, 4141.
506, 43. German, 3739, 4134, 4141.
506, 44. French, 4131, 4258.
506, 47. Russian, 4133.
506, 7. North American, 3121, 3535, 4141, 4199.
506, 71. British American, 3661, 4132.
506, 73. United States, 4142.
506, 744. Massachusetts, 4132, 4134, 4138, 4222.
506, 747. New York, 3316, 4100, 4131.
506, 748. Pennsylvania, 4058, 4187.
506, 749. New Jersey, 4066.
506, 774. Michigan, 4095.
506, 777. Iowa, 4104.
506, 944. New South Wales, 4142, 4194.
507. Education. Prizes, 1134, 4258.
Museums. *In Sweden,* 4130.
Schools. *In Connecticut,* 4132. *In Kansas,* 4048.

52. ASTRONOMY.

529. Chronology. Almanacs, 3651-3658.

53. PHYSICS.

535. Optics. Coloration of scales, 4119.

54. CHEMISTRY.

542. Experimental. Solvent of chitin, 4204.
543. Analysis, 3360=3507. Composition of blood of insects, 3468; of coloring matter of cocoons, 3383; of galls of cynips, 3341.
544. Qualitative analysis. Spectrum of light of pyrophorus, 4068.
546. Inorganic chemistry. Hydrogen phosphate, 3393-3394.
547. Organic chemistry. Effect of formic acid (CH_2O_2) on honey, 3722 (4219), 3739, 4256; of "mud" of termitina on glass, 4245; of potassic cyanide (KCN) on color, 3305, 3636, 4072. Naphthalin ($C_{10}H_8$) 4073.

55. GEOLOGY.

551, 5. Meteorology. Winds, 3835. Climate, 4123.
551, 7. Stratigraphical geology. *Distribution of fossils,* 3521, 3542, 4269. Palaeozoic, 4086. Mesozoic, 4087.
551, 74. Devonian, 3524, 4080.
551, 75. Carboniferous, 3275, 3526, 3541, 3681, 3941, 4076, 4085.
551, 78. Tertiary, 3276, 3542, 4083, 4195. Amber, 4083.

56. PALEONTOLOGY.

[For stratigraphical distribution of fossils, see **551, 7.**]
560, 9. Geographical distribution of fossils, 4085-4086.
560, 941. Scotland, 3524, 4080.
560, 942. England, 3541.
560, 944. France, 4076.
560, 977, 3. Illinois, 3275, 3526.
560, 978, 7. Wyoming, 3276.
560, 978, 8. Colorado, 3276, 3542, 4083.
560, 994. Australia, 4195.
561. Fossil plants, 3941.
565. Fossil articulata, 4086.
565, 1. VERMES, 4269.
565, 4. ARACHNIDA, 4269. Anthracomartus, 4085.

565, 6. Myriopoda, 3524 (4080), 4269.
565, 7. Hexapoda, 3541, 3884, 4083, 4087. Etoblattina, 3275. Dictyoneura, 3681. Termitina, 3542. Ephemera, 4195. "Neuroptera," 3276. Sialidae, 3521.

57. BIOLOGY.

570,1. Philosophy of biology. Biological problems, 3425. Rules of nomenclature, 3271, 3363, 3919, 3949, 3977.
570,6. Societies of biology.
Proceedings: Biol. soc. Wash., 4073; Linn. soc. Lond., 4190-4193, 4205; Linn. soc. New South Wales, 4188, 4194-4195, 4208.
570,7. Education in biology. Observing, 3693, 3932, 3939, 3960. *Describing*, 3509, 3514-3515.
575. Evolution, 3439.
575,1. Heredity. *Atavism*, 3690. *Phyletic parallelism*, 4031.
575,2. Variation [*see also* **581,15** *and* **591,15**]. *Origin of types of coloration*, 3437, 3587, 3762, 4031.
575,3. Environment [*see also* **591,155** *and* **591,57**]. *Adaptation to surroundings*, 3437, 3439, 4175.
575,4. Natural selection. *Correspondence of structure with habits*, 3583, 3686.
575,5. Sexual selection, 3825, 4284. *Adaptations of sexual structure to varying conditions*, 3532. *Adaptations of structure to sexual purposes*, 3534.
575,6. Development. *Social development*, 3436.
575,7. Degeneration. *Rudimentary organs*, 3940.
575,8. Origin of species. *Ancestry*, 3257, 3471, 3837, 3970, 4269. *Criteria of genera and species*, 3337, 3444, 3766, 3790, 3837. *"Darwinism,"* 3790. *Final causes of transmutation*, 3587.
576. Origin of life. *Mechanical conception of nature*, 3587.
577. Properties of living matter.
577,1. Chemical properties of living matter. *Action of re-agents on blood*, 3468.
577,4. Conditions of vital action. Luminosity, 3393-3394.
578. Microscopy.
578,6. *Preparation and mounting*, 3235, 3640, 4078, 4081, 4084, 4149, 4164. Materials, 4267. Staining, 4078.
579. Collecting and preserving [objects of natural history]. Galls, 3354. Hexapoda, 3651-3658. Diptera, 3396 (3404), 3405, 4295. *Plan of formation of collections*, 3710.
Acquiring. *Exchanges*, 4184. *Price-lists*, 4123. *Requests for specimens.* Galls, 3354, 3415, 4261. Oniscoda, 4138. Odonata, 4136. Coccidae, 4094. Coleoptera, 4139, 4143, 4283. Lepidoptera, 4130, 4143, 4152, 4268, 4290. *Specimens for sale*, 3318, 4078, 4264.
Apparatus, 3488, 3538, 3786, 3956, 4006.
Goods for sale, 4139.
Arranging, 3294, 4006.
Collecting, 3543, 3601-3602, 3663, 3693, 4130, 4157.
Alluring. By baits, 3538, 3606. *By light*, 3978. *By fruit*, 3888. *By "sugar,"* 3606, 3883.
Hunting. On flowers, 3643, 4045.
Killing, 3237, 3636.
Trapping, 3538.
Preparing, 3543, 3933, 4255. *Denuding wings*, 3916. *Dissecting*, 3131, 4167. *Pinning*, 3490.
Preserving, 3480, 4125, 4257.
Attacks of museum pests, 3772, 4167, 4288.
Drying specimens, 3640.
Pestifuges, 3406. Carbon disulphide, 3758. Naphthalin, 3298, 3556, 3774, 3928, 3931, 4073.
Preventatives of mold. Carbolic acid, 3305.
Retention of colors, 4293.
Rearing. Coleoptera, 3608, 4087. Diptera, 3618. Lepidoptera, 3236, 3475, 3693, 3695, 3785, 4101, 4126, 4202. *In gases*, 4086-4087.
Transporting, 3490.

58. BOTANY.

581. *PHYSIOLOGICAL BOTANY.*

581,1. VEGETAL PHYSIOLOGY.

581,14. Secretion and excretion, 3563, 4095, 4183.
581,15. Variation. *Mimicry*, 3527. Polymorphism, 3563.
581,16. Generation. *Fertilization*, 2410 (3741), 2369 (3743-3744).
581,18. Sensory functions. *Irritability*, 3537.

581,2. VEGETAL HEXIOLOGY: WELFARE AND ILLS.

581,22-581,24. Welfare of plants.
Caprification, 4131.
Dissemination. *By insects*, 3527.
Pollination, 3289, 3373, 3376, 3434 (3438), 3437. Aquilegia, 3673. Oxalis, 3563. Trifolium, 4173. Cassia, 3558. Pastinaca, 3551, 3564. Primula, 3680. Apocynum, 3476. Solanum, 3558. Orchidaceae, 2378 (3720, 3725). Amaryllis, 3565. Symplocarpus, 1794 (3552, 3562). Gramineae, 3545.
581,28. Injuries by plants, 3609. *Phytocecidia*, 4177.
581,29. Injuries by animals, 3307, 3309, 3325, 3333, 3628, 3865-3866, 3927, 3961, 4086-4087, 4101, 4206, 4223. Orchards, 3547, 3752, 4196. Nuphar, 3247. Cruciferae, 4013, 4194. Capparidaceae, 3322. Viola, 4219. Thea, 4298. Gossypium, 3307, 3614, 3835, 3993. Urena, 3333. Aristotelia, 4171. Pelargonium, 4086. Citrus, 3105, 3109, 3112, 3116, 3599-3600. Vitis, 3573, 3593. Trifolium, 3309, 3325-3326, 3473. Phaseolus, 3969. Rosaceae, 4162. Prunus, 3113, 3254, 4179. Fragaria, 4142, 4155. Rosa, 3499. Pyrus, 3318, 3546, 4179. Crataegus, 3136, 4179. Liquidambar, 4174. Leptospermum, 4171. Oenothera, 3465. Cucurbita, 4270. Silphium, 3221. Tanacetum, 4162. Vaccinium, 4162. Olea, 4171. Fraxinus, 3746. Asclepias, 3580, 3628. Nicotiana, 3718. Scrophularia, 4080. Veronica, 4219. Catalpa, 3308. Chenopodium, 3348. Rumex, 3446. Aristolochia, 3668. Elaeagnus, 4172. Santalum, 4144. Celtis, 4239. Ficus, 4028. Maclura, 3329. Platanus, 3695. Carya, 3269. Betula, 4101 (4083). Quercus, 3328, 3669, 3707, 3787, 4142. Populus, 3269, 3297, 3887, 3979. Yucca, 3378. Pontederia

3143. Oryza, 3319, 3327, 3330-3332, 3335-3336, 3348. Triticum, 3609. Sorghum, 3347. Zea, 3307, 3310, 3321, 3346, 3747, 3771, 3882. Pinus, 3111, 3623, 3755-3756, 3763, 3956, 4086. Abies, 3240. Fungi, 3516, 3527, 4162. Polyporus, 4101.

Zoocecidia, 3342-3343, 3349-3354, 3398-3399, 3403, 3425, 3769, 4177, 4198. Tilia, 3451. Pelargonium, 3340. Vitis, 3352-3353, 3409, 3451-3453, 3769. Acer, 3421. Negundo, 3753. Amorpha, 3339. Acacia, 4278. Rosaceae, 3421-3422, 3427, 3429, 3448-3449. Rubus, 3352, 3447. Rosa, 4218. Eucalyptus, 3419, 3738, 3760. Compositae, 3408, 3427, 3450. Solidago, 3400-3401, 3414, 3446, 3698. Artemisia, 3417, 3450. Hieracium, 4218. Fraxinus, 3753. Ulmus, 3753. Celtis, 3353, 3727-3728, 3761. Juglans, 4141. Carya, 3353. Cupuliferae, 3427. Quercus, 3106-3107, 3341, 3416, 3420, 3425-3426, 3454, 3501, 3575. Fagus, 3927. Salix, 3428, 4218. Populus, 4004. Pinus, 3413. Cupressus, 3411. Vaucheria, 4177.

Phytoptocecidia (Erinea, Phylleriaceae, Cephaloneae), 4141, 4177.

581,3. VEGETAL EMBRYOLOGY.

Immature forms. Entomophthora (Tarichium), 3679.

581,4. VEGETAL MORPHOLOGY.

Galls, 3342.

581,5. VEGETAL BIOLOGY.

581,53. Food-habits.

Capture of animals for food, Sarracenia, 3375. Drosera, 3375, 3537, 4141. Dionaea, 3374, 3537.

Parasitism. Uredo, 3609. Entomophthora, 3679, 3748, 3754. Appendicularia, 4141. Bacterium, 3959.

581,54. Seasons. Gramineae, 3545.

Proterandry and proterogyny. Umbelliferae, 3551, 3564. Amaryllis, 3565.

581,57. Means of self-preservation. Nectar, 3437 (3438).

581,59. Other relations to the surrounding world.

Attractiveness to insects, 4172. Darlingtonia, 3604. Bixa, 4265. Pelargonium, 4194. Vitis, 3637. Prunus, 4295. Rubus, 4295. Oenothera, 3465, 4156. Cornus, 4078, 4295. Sambucus, 3687, 4284. Solidago, 4045. Ambrosia, 3687, 4284. Tanacetum, 4284. Centaurea, 3895. Phlox, 4198. Bignonia, 4265. Elaeagnus, 4172. Betula, 4172. Alnus, 4149, 4197. Salix, 3643, 4078. Populus, 4284. Musa, 4265. Hypoxys, 3381. Pinus, 3284. Thuja, 3687.

Capture of animals [*for* Capture as food, *see* **581,53**]. Mentzelia, 3528. Apocynum, 3476. *By leaves*, 3537. Pinus, 4170.

Mutual relations of plants and animals, 3351, 3353, 3427, 3440, 3742. Fungi, 4162, 4286.

Modifying influence of plants upon insects. Lamium, 3439.

581,6. ECONOMIC BOTANY.

581,63. Direct usefulness, *As food.* Cyperus, 4182. *For honey* Papaver, 4183. Trifolium, 4294. *For manna.* Eucalyptus, 4191. Echinops, 4177. Myrica, 4182. *For opium.* Papaver, 4183.

581,64. Usefulness in arts and commerce. *As insectipells.* Lycopersicum, 4281. *As timber.* Catalpa, 3308.

581,7. VEGETAL ANATOMY.

Brachyphyllum, 3884.

581,73. Anatomy of leaves. Convallaria, 4119.

581,76. Anatomy of flowers, 3289. Apocynum, 3476.

581,79. Anatomy of other structures *Galls*, 3342, 3349-3353. *Hairs.* Mentzelia, 3528.

581,9. GEOGRAPHICAL DISTRIBUTION. Celtis, 3724, 3728.

Special Botany.

[Under **582-589**, no reference is made by name to the genera already referred to under **581.**]

582. PHANEROGAMIA,

4101, 4206, 4228, 4286.

583. DICOTYLEDONAE.

583,111. **Ranunculaceae,** 3673.
583,118. **Nymphaeaceae,** 3247.
583,121. **Sarraceniaceae,** 3375, 3604.
583,122. **Papaveraceae,** 4183.
583,123. **Cruciferae,** 4013, 4194.
583,131. **Capparidaceae,** 3322.
583,135. **Violaceae,** 4219.
583,138. **Bixaceae,** 4265.
583,166. **Ternstroemiaceae,** 4298.
583,17. **Malvaceae,** 3307, 3383, 3614, 3835, 3993.
583,19. **Tiliaceae,** 3451, 4171.
583,223. **Geraniaceae,** 3340, 3563, 4086, 4194.
583,23. **Rutaceae,** 3105, 3109, 3112, 3116, 3599-3600.
583,279. **Ampelidaceae** (Vitaceae), 3352-3353, 3409, 3451-3453, 3573, 3593, 3637, 3769.
583,281. **Sapindaceae,** 3753.
583,32. **Leguminosae,** 3309, 3325-3326, 3339, 3473, 3558, 3969, 4086-4087, 4173, 4294.
583,37. **Rosaceae,** 3113, 3136, 3254, 3313, 3352, 3421-3422, 3427, 3429, 3447-3449, 3499, 3546, 4142, 4155, 4162, 4179, 4218, 4295.
583,393. **Droseraceae,** 3374-3375, 3537, 4141.
583,394. **Hamamelidaceae,** 4174.
553,42. **Myrtaceae,** 3419, 3738, 3760, 4171, 4191.
583,445. **Onagraceae,** 3465, 4156.
583,453. **Loasaceae,** 3528.

583,461. **Cucurbitaceae**, 4270.
583,481. **Umbelliferae**, 3551, 3564.
583,497. **Cornaceae**, 4078, 4295.
583,51. **Caprifoliaceae**, 3687, 4284.
585,55. **Compositae**, 3221, 3400-3401, 3404 3408, 3414, 3417, 3427, 3446, 3450, 3687, 3698, 3895 4045, 4162, 4177, 4218, 4284, 4295.
583,61. **Vacciniaceae**, 4162.
583,672. **Primulaceae**, 3680.
583,71. **Oleaceae**, 3746, 3753, 4171.
583,72. **Apocynaceae**, 3476.
583,73. **Asclepiadaceae**. 3580, 3628.
583,761. **Polemoniaceae**, 4198.
583,79. **Solanaceae**, 3558, 3718, 4235, 4281.
583,81. **Scrophulariaceae**, 4080, 4219.
583,84. **Bignoniaceae**, 3308, 4265.
583,891. **Labiatae**, 3439.
583,914. **Chenopodiaceae**, 3348.
583,917. **Polygonaceae**, 3446.
583,924. **Aristolochiaceae**, 3668.
583,935. **Elaeagnaceae**, 4172.
583,943. **Santalaceae**, 4144.
583,951. **Euphorbiaceae**, 4235.
583,962. **Urticaceae**, 3329, 3353, 3721, 3727-3728, 3753, 3761, 4028.
583,971. **Platanaceae**, 3695.
583,973. **Juglandaceae**, 3269, 3353, 4141.
583,974. **Myricaceae**, 4182.
583,976. **Cupuliferae**, 3106-3107, 3328, 3341, 3416, 3420, 3425-3426, 3454, 3501, 3575, 3669, 3707, 3737, 3927, 4101 (4083), 4142, 4149, 4172, 4197
583,981. **Salicaceae**, 3269, 3297, 3428, 3643, 3887, 3979, 4004, 4078, 4218, 4284.

584. MONOCOTYLEDONAE.

584,15. **Orchidaceae**, 2378 (3720, 3725).
584,21. **Scitamineae**, 4265.
584,25. **Amaryllidaceae**, 3381, 3565.
584,32. **Liliaceae**, 3378, 4119.
584,34. **Pontederiaceae**, 3143.
584,64. **Araceae**, 1794 (3552, 3562).
584,84. **Cyperaceae**, 4182.
584,9. **Gramineae**, 3307, 3310, 3319, 3321, 3327. 3330-3332, 3335-3336, 3346-3348, 3545, 3609, 3747, 3771, 3882.

585. GYMNOSPERMAE.

585,2. **Coniferae**, 3111, 3240, 3284, 3411, 3413, 3623, 3687, 3755-3756, 3768, 3884, 3956, 4086, 4101, 4170, 4206.

586. CRYPTOGAMIA.

587. PTERIDOPHYTA.

587,3. **Filicinae**, 4276.

589. THALLOPHYTA.

589,2. UNGI.

3516, 3527, 4162, 4286.
589,22. Basidiomycetes.
589,222. *Hymenomycetes*, 4101.
589,225. *Uredineae*, 3609.
589,229. *Entomophthoreae*, 3679, 3748, 3754.
589,23. Ascomycetes, 4141.

589,3. ALGAE.

4177.

589,7. PROTOPHYTA.

589,95. Schizomycetes, 3959.

[END OF SPECIAL BOTANY.]

59. ZOOLOGY.

590,3. Dictionaries of zoology. *Vernacular names*, 4008. Heterodon, 4087.
590,6. Societies of zoology.
590,642. *British*, 4299-4300.
590,643. *German*, 4138.
590,674,4. *Massachusetts*, 4137.
590,7. Education in zoology.
MUSEUMS. Mus. comp. zool., 4223, 4289. Zool. mus. Copenhagen, 4131.
PRIZES, 3968.

590,9. History of zoology. Bible animals, 4008.

591. *PHYSIOLOGICAL ZOOLOGY.*

Bibliography of entomology, 3300-3303, 3306.

591,1. ANIMAL PHYSIOLOGY.

591,11. Circulation. Plusia, 4130. Apis, 3634.
591,12. Respiration, 3535. Larvae, 4209. Coleoptera, 3603, 4066. Cataclysta, 3745.
591,13. Nutrition. Tenebrio, 3510. Culex 4082. Telea, 3674. Apis, 4193.
591,139. *Fasting.* Araneina, 4136. Lepidoptera, 3379.
591,14. Secretion and excretion. Attacus, 4081.
591,142. *Constructive secretion.* Adhesive, 3122, 3721, 3939. Cocoon-varnish, 3883. Lac, 3974. Wax, 3410, 4203.
591,143. *Digestive secretion.* Salivary, 3337, 4118.
591,144. *Attractive, defensive, and offensive secretion.* Attractive, 4056. Nectar, 4065. Odorous, 3127, 3579, 4284. Defensive, 3930.
591,145. *Poisonous secretion.* Lepidoptera, 3461. Hymenoptera, 3685, 3722 (4219), 3739, 4089.
Gall-forming, 3349, 3425.
Urticating. Lepidoptera, 3607, 3675-3677, 3765, 3918, 3920.
591,146. *Sexual secretion.* Odorous, 3678, 3740.
591,147. *Protective secretion.* Eleodes, 4296. Lepidoptera, 3574, 3624, 3772. Hymenoptera, 3901.
591,148. *Excretion.*
591,149. *Other secretions and excretions.* Coloring matter, 3383. Luminous matter, 3393-3394. Silk

591,15. Variation. Hexapoda, 3234, 4179. Coleoptera, 3387, 4087, 4284. Apiocera, 4096. Lepidoptera, 3216, 3257, 3776, 3837, 3859-3860, 3995, 4020, 4299.

591,151. Polymorphic variation. Cecidozoa, 3349. Larvae, 3587. Hexapoda, 4031. Rhynchota, 3571, 3577. Odontolabidae, 4122, 4300. Blepharoceridae, 3443, 4444 (3519). Lepidoptera, 3845. Hymenoptera, 3403, 3891, 4168.

591,152. Geographic variation.

591,153. Heterophagic variation. Coleoptera, 3628, 4149. Smerinthus, 4031. Isosoma, 3770.

591,154. Polygoneutic variation. Hexapoda, 3882, Lepidoptera, 3829.

591,155. Mimetic variation, 3574, 3624. Larvae, 4031. Hexapoda, 3437. Coleoptera, 4284. Lepidoptera, 3465, 3902, 4149.

591,156. Sexual variation. Arachnida, 3 25. Hexapoda, 4200. Acanthococcus, 3472. Boletothrus, 4083. Blepharoceridae, 3443. Lepidoptera, 3579, 3597, 4240. Hymenoptera, 3583, 3901.

591,157. Coloration al variation. Araneina. 4064. Coleoptera, 4284. Cicindela, 3559, 3644, 3671-3672. Lepidoptera, 3762. Rhodophora, 3465. Bombycidae, 3921, 3982, 4149. Sphingidae, 3587, 3965, 4085. Papilio, 3858, 4149. Vanessa, 3390. Argynnis, 4087. Hymenoptera, 3901.

591,158. Hybrids.

591,159. Monstrosities [*see also* **591,167.** Hermaphrodites]. Coleoptera, 3153, 3251, 4087. Lepidoptera, 3141, 3151, 3380, 3391, 3525, 4179, 4277.

591,16. Generation.

591,161. Abiogenesis.

591,162. Parthenogenesis. Arthropoda, 4022. Gastrophysa, 3518, 3523, 4021-4022. Lepidoptera, 3585, 3620, 4191. Hymenoptera, 3155, 3457, 3460, 3639, 3901, 4246.

591,163. Metagenesis. Ephemerella, 4042. Aphididae, 3323. Cynips, 3403, 3416.

591,167. Hermaphroditism. Trombidium, 4016, 4019. Hexapoda, 4179. Lepidoptera, 3140, 3227, 3371, 3392, 3787, 3861, 4007, 4015, 4165. Macropis, 4149.

591,18. Nervous functions and sensations. Articulata, 3291 *w*. Hexapoda, 4191. Formicidae, 3435-3436.

Color-sense. Apidae, 3434.

Hearing. Arachnida, 3824.

Sight. Arthropoda, 3880. Hexapoda, 4087, 4205. Forficula, 4085. Coleoptera, 3366, 3369. Telea, 3674.

591,19. Other functions.

Longevity [*see also* **591,139.** Fasting], 3345. Calliphora, 4069. Lepidoptera, 3123, 3345, 3648. Formicidae, 3435.

Luminosity. Geophilus, 4282. Fulgoridae, 4149. Lampyridae, 3393-3394, 3589. Pyrophorus, 4068.

Movement. *Actirity.* Hymenoptera, 3434, 3439. *Climbing,* 3122. *Flight,* 3395, 4188. Acridiidae, 3291 *j*. *Leaping.* Hexapoda, 3828. Formicidae, 4185. *Locomotion,* 3320, 3939. Sphingidae, 4193. *Muscular contraction,* 4188. *Function of halteres.* Diptera, 3968. *Function of legs.* Hexapoda, 3937.

Sleep. Hymenoptera, 3895.

Sonifaction. Atropos, 3611, 4055. Conocephalus, 4100. Anobium, 4055. Acherontia, 3664. Formicidae, 3958, 4029-4030.

Stinging. Apis, 4219.

Strength. Hexapoda, 3874.

591,2. ANIMAL HEXIOLOGY: WELFARE AND ILLS.

591,21. Effects of external conditions.

Exclusion of air. Telea, 3674. *Parasitism,* 3345. *Temperature.* Lepidoptera, 3674, 3773, 3829, 3914. *Weather.* Hexapoda, 4123, 4228. Acridiidae, 3291 *f*. Bombyx, 3441.

591,22. Welfare of animals.

Dissemination. Bombus, 4173.

Exemption from parasitism. Bombus, 4110.

591,25. Ills of animals. [*For* Means against animals, *see* **579, 632,** etc.]

591,26. Diseases. Cicada, 3577.

591,27. Injuries by chemical and physical agencies.

Injuries by chemical agencies. 3468. *Poisons,* 3869, 4067. *Chloroform* [$CHCl_3$], 3237. *Naphthalin* [$C_{10}H_8$], 4073. *Potassium cyanide* [KCN], 3636.

Injuries by physical agencies. *Drought,* 3314.

591,28. Injuries by plants.

Capture [*see also* **581,53.** Capture for food] 3374-3375, 3528, 3537, 3604.

Parasitism. *By fungi.* Calopteuus, 3679, 3748, 3754. Drosophila, 4141. Lepidoptera, 3362. *By bacteria.* Blissus, 3571, 3959.

Poisoning. *By pyrethrum.* Plusia, 4130.

591,29. Injuries by animals [*see also* **591, 53.** Food-habits of animals].

Parasitism, 3345, 3379. Cecidozoa, 3349, 3397, 4201, 4218. Domestic animals, 3566-3569, 3749.

Hexapoda, 3372, 3583. Macrotoma, 4062. Rhynchota, 3105, 3110, 3761. Coleoptera, 3413, 4207, 4262. Diptera, 3115-3116, 4086. Lepidoptera, 3334, 3450, 3956. Hymenoptera, 3107, 3422, 3448, 4207.

Internal parasites, 3119. Domestic animals, 3569 Brachymena, 3886. Coleoptera, 3384, 3820, 3897. 4141. Asphondylia, 3398. Lepidoptera, 3262, 3338, 3516, 3614, 3674. Hymenoptera, 3107, 3427, 3667, 3815, 4110.

Intestinal parasites. Periplaneta, 3736. Termitidae, 4178. Bombus, 4133. Rhinoceros, 4121. Equus, 3998.

Cuticular parasites. Mammalia, 3823, 3998, 4086-4087.

External parasites, 3778. Araneina, 3286, 3364. Lepidoptera, 3293. Ovis, 3312.

External feeders. Rhynchota, 3328, 3706, 3726 3728, 4149.

Guests. Diastrophus, 3427.

Egg-parasites. Microcentrum, 3598. Smerinthus, 4087. Limenitis, 4199. Nematus, 4199.

Secondary parasitism, 3345.

Pursuit. Lumbricus, 4149. Hexapoda, 3960-3962. Odonata, 3158-3159. Acridiidae, 3291 *i*, *m*, *n*. Coccidae, 3599. Phylloxeridae, 3759, 4004. Aphididae, 3113. Erythroneura, 3546. Cicada, 3577, 4087. Blissus, 3571. Coleoptera, 3309, 3578. Lepidoptera, 3332, 3582, 3674, 4149. Pieridae, 3574, 3617, 4133. Formicidae, 3435. Apis, 3898. Hyla, 4166.

591,3. ANIMAL EMBRYOLOGY AND DEVELOPMENT.

Gregarina, 3736. Arthropoda, 3871. Chilopoda, 3764. Caloptenus, 3137. Tenebrionidae, 3972. Tincina, 3686. Bombyx, 4128.

Rate of growth. Telea, 3674.
Retardation of development, 3345. Hexapoda, 3536. Epicauta, 3291 *n*. Saturnia, 3485. Sphinx, 3486. Ichneumonidae, 3484.

591,31. Spermatogenesis.

591,32. Oogenesis. Geophilidae, 3788.

591,33. Segmentation. Gelechia, 4087.

591,34. Embryogenesis, 4246. *Malpighian tube*, 3690, 3789. *Ovaries*, 3388. *Ducts of sexual glands*, 3500.

591,37. Metamorphosis.

[Arachnida.] Phytoptidae, 3753. Demodex, 3823. Tyroglyphus, 3599.

Hexapoda, 3290 *f*, 3578.

[Neuroptera.] Corydalus, 3506, 3521, 3531-3535, 3550.

[Rhynchota.] Acanthococcus, 3472. Chermes, 3755-3756. Psyllidae, 3727, 4014. Cicada, 3577.

[Coleoptera.] Phytonomus, 3309. Doryphora, 3466, 3578. Diabrotica, 3747. Eucrada, 3630. Chauliognathus, 3291 *n*.

[Diptera.] Drosophila, 3714. Bombyliidae, 3536. Blepharoceridae, 3455. Simulium, 3618. Pulicidae, 4053. Cecidomyia, 3454, 3666, 3689. Diplosis, 3399.

[Lepidoptera.] Platyptilia, 3539. Lithocolletis, 3909. Carpocapsa, 3922. Crambus, 3334. Heliothis, 3307, 3549, 3882. Anomis, 3333, 3835. Aletia, 3570, 3835. Telea, 3674. Arctia, 3922. Aegeria, 3922. Sphinx, 3308. Philampelus, 3596. Papilio, 3647, 3668. Thecla, 3254. Grapta, 3859. Phyciodes, 3944. Coenonympha, 3945.

[Hymenoptera.] Cynips, 3454. Polysphincta, 3364.

Eggs. Tyroglyphus, 3737. Sialis, 3521. Belostoma, 3532-3534, 3550. Coraebus, 3737. Mallophora, 3291 *n*. Lepidoptera, 3461. Oeta, 3288. Crambus, 3311. Aletia, 3333. Orgyia, 3616. Pamphila, 3688.

Eggs and larvae. Diplax, 3967. Chauliodes, 3535. Chrysomphalus, 3600. Phytonomus, 3325. Eleodes, 3971. Coscinoptera, 3615. Crioceris, 3548. Papilio, 3635. Selandria, 3746.

Larvae.

Hexapoda, 3939.

[Rhynchota.] Publilia, 4056. Belostoma, 3531.

[Coleoptera.] Rhodobaenus, 3310. Rhynchophorus, 3310. Lissorhoptrus, 3348. Chalepus, 3331. Tenebrionidae, 3970, 3972. Phyllotreta, 3554, 3584. Prionidae, 3572. Agrilus, 3352, 3447. Alaus, 3147. Cotalpa, 4032. Lucanus, 3147, 3963. Silpha, 4038. Necrophorus, 4036. Patrobus, 4037. Calosoma, 4034.

[Diptera.] Ephydra, 3781. Piophila, 3560. Oestrus, 3917. Hirmoneura, 3897. Cecidomyidae, 3454. Cecidomyia, 3349, 3398, 3409, 3411, 3474.

Lepidoptera, 3212, 4031. Tineina, 3686, 3691, 3693-3694. Nepticula, 3695. Lithocolletis, 3904, 3906. Walshia, 3339. Batrachedra, 3698. Gelechia, 3450. Choreutes, 3221. Anaeglis, 3112. Tortricidae, 3954. Eurytichia, 3343. Melanippe, 3391. Cymatophora, 3261. Noctua, 3431. Rhodophora, 3465. Telesilla, 3719. Crambodes, 3719. Adipsophanes, 3719. Arzama, 3247. Clisiocampa, 3282. Callosamia, 3540. Attacus, 3592. Orgyia, 3217, 3385, 3921. Arctia, 3261. Sphingidae, 3587. Sphinx, 3329, 3957, 3965. Smerinthus, 3143, 3151. Eudamus, 3688. Apatura, 3856.

[Hymenoptera.] Nematus, 3350, 4031. Euura, 3350. Cynipidae, 3454. Rhodites, 3422. Apanteles, 3345.

Larvae and pupae.

Coleoptera, 3145. Sphenophorus, 3310. Boletotherus, 4001. Prionus, 3572. Ceruchus, 3963. Elodes, 3625. Pomatinus, 3625. Parnus, 3625. Coccinellidae, 3704.

[Diptera.] Leucopis, 3759. Drosophila, 3711. Trypeta, 3700. Pipiza, 3547. Systoechus, 3291 *n*. Triodites, 3291 *n*. Sciara, 3709. Cecidomyia, 3428. Diplosis, 3726, 3759.

[Lepidoptera.] Bedellia, 3695. Penthina, 3499. Retinia, 3763. Chilo, 3332. Dakruma, 3706. Pempelia, 3346. Cataclysta, 3745. Noctuidae, 3245. Catocala, 3269. Aletia, 3614. Leucania, 3582. Hydroecia, 3634. Cossus, 3887. Ceratocampa, 3579. Notodonta, 3149. Nola, 3347. Aegeria, 3148. Philampelus, 3150. Pamphila, 3688. Pieris, 3322. Limenitis, 3574. Grapta, 3860. Danais, 3580.

[Hymenoptera.] Tenthredinidae, 3901. Diastrophus, 3427.

Pupae. Passalus, 3963. Elmis, 3625. Carabidae, 4040. Cicindela, 4040. Danais, 3449.

Molting. Ephemerina, 3317. Oestridae, 4075. Geometridae, 4169. Orgyia, 3385.

Hypermetamorphosis, 3557. Acarina, 4192.

Pupation. Lepidoptera, 3757, 4194.

Emergence. Lepidoptera, 3101, 3104, 3135.

591,4. ANIMAL MORPHOLOGY; HOMOLOGY.

Arthropoda, 3471, 4269. Coccinae, 3708. *Number of legs.* Peripatus, 3133.

NERVOUS SYSTEM. Diptera, 3735. Hymenoptera, 3358.

INTEGUMENT AND DERMOSKELETON. Chalcididae, 4149. *Head.* Musca, 4210. *Eyes.* Arthropoda, 3880.

591,5. ANIMAL BIOLOGY.

Habits and behavior; life-histories.

[Vermes.] Sphaerularia, 4087.

Arachnida, 3825. Phytoptidae, 3750, 3753. Demodex, 3823. Araneina, 3517, 3561, 4097. Theridiidae, 3723. Epeiridae, 3948. Buthus, 4082.

[Onychophora.] Peripatus, 3133.

Myriopoda, 3930.

Hexapoda, 3359, 3573, 3716, 3927.

[Orthoptera.] Caloptenus, 3291 *u*. Anabrus, 3291 *i*. Myrmecophila, 4081.

[Pseudoneuroptera.] Embiidae, 4300. Ephemeridae, 4191.

[Neuroptera.] Corydalus, 3511, 3521, 3531-3534, 3550. Trichoptera, 3480, 3915.

[Rhynchota.] Pediculus, 3631. Rhizococcus, 4144. Acanthococcus, 3472. Lecanium, 3670. Chrysomphalus, 3600. Phylloxera, 3769. Chermes, 3755-3756. Schizoneura, 3547. Fulgoridae, 4149. Aphrophoridae, 4195. Cicada, 3577. Cimex, 3631. Phymata, 3926. Blissus, 3571.

Coleoptera, 3145, 4284. Sphenophorus, 3310, 3321. Lissorhoptrus, 3335, 3348. Phytonomus, 3309, 3325. Podapion, 3413. Boletotherus, 4001. Eleodes, 4296. Bruchus, 3833, 3969. Phyllotreta, 3554, 3584. Diabrotica, 3747. Doryphora, 3466. Eumolpini, 4155-4156. Crioceris, 3548. Oberea, 3450. Xylotrechus, 3136. Prionus, 3572. Chalepus, 3331. Cotalpa, 4032. Hypotrichia, 4170. Amphicoma, 3896. Ozognathus, 3501. Chauliognathus, 3291 *n*.

Buprestidae, 3352. Alaus, 4078. Coccinellidae, 3704. Paussus, 4147. Aleochara, 3619. Calosoma, 4034.
Diptera, 3631. Drosophila, 3711, 3714. Compsomyia, 4297. Tachina, 3614. Oestridae, 3917, 4075. Bombyliidae, 3291 *n*, 3536. Culex, 4087. Simulium, 3618. Pulicidae, 4053. Sciara, 3709. Cecidomyia, 3473-3474, 3665-3666, 3689.
Lepidoptera, 3629, 3691, 3694. Tineina, 3698. Lithocolletis, 3904-3910. Gracilaria, 3913. Gelechia, 3450. Depressaria, 3692. Chorsutes, 3221. Penthina, 3499. Eudemis, 3573. Retinia, 3763. Crambus, 3334. Chilo, 3332. Dakruma, 3706. Pempelia, 3346. Anaeglis, 3112. Oedematophaga, 4278. Pseudaglossa, 3989. Heliothis, 3307, 3549, 3882. Aletia, 3570, 3614. Anomis, 3333. Leucania, 3582. Laphygma, 3330. Cossus, 3887. Clisiocampa, 3282. Ceratocampa, 3579. Callosamia, 3540. Attacus, 3592. Telea, 3674. Nola, 3347. Melittia, 4270. Sphinx, 3308. Philampelus, 3596. Papilio, 3129. Parnassius, 4149. Apatura, 3104. Grapta, 3680. Phyciodes, 3944. Argynnis, 3258, 3845. Heliconidae, 3624.
Hymenoptera, 3583, 3901. Selandria, 3746. Cynipidae, 3855. Trichogramma, 4199. Pirene, 3450. Isosoma, 3770. Telenomus, 3886. Microgaster, 3450. Hemiteles, 3450. Formicidae, 3435-3436 (3438), 4058. Formica, 4193. Lasius, 4187. Atta, 3477, 3894. Pogonomyrmex, 3102. Larridae, 4011-4012. Osmia, 3817. Bombus, 3821. Apis, 3285.
591,51. Instinct—Reason. Hexapoda, 3662. Lepidoptera, 3826, 4235. Formicidae, 3934. Stizus, 3964.
Cleanliness. Hexapoda, 3937.
Fallibility. Hexapoda, 4172. Coleoptera, 3366, 3369. Dytiscus, 3478.
Methodicity. Hexapoda, 3645.
Pugnacity. Ceratocampa, 4139. Apidae, 4146. Aves, 4149.
Stratagems. Hexapoda, 3683.
591,52. Abode. Tarentula, 3123. Hexapoda, 3583. Phryganeidae, 3915. Phymata, 3617. Ptinus, 3610. Bucculatrix, 3612. Taeniocampa, 3365. Nonagria, 4078. Aves, 4099.
Galls, 3349-3354, 3415-3420, 3425-3427, 3454, 3738, 4177, 4230. Acarina, 3340, 3421, 3451. Hexapoda, 3403. Dactylosphaera, 3769. Psyllidae, 3724, 3727-3728, 3761. Enchophyllum, 3410. Apioninae, 3413. Diptera, 3400, 3408. Trypeta, 3401. Acinia, 3450. Sciara, 3709. Cecidomyidae, 3398-3399, 3401, 3409, 3411, 3414, 3428, 3451-3454. Lepidoptera, 3418. Walshia, 3339. Gelechia, 3446. Euryptichia, 3401, 3408. Cochylis, 3450. Cynipidae, 3355. Rhodites, 3422, 3429, 3448-3449. Cynips, 3341, 3357, 3416, 3425, 3501.
Habitats. Vermes, 3361. Buprestidae, 3602. Diptera, 4120. Lepidoptera, 3760. Bucculatrix, 3687. Lycaenidae, 4070. Danais, 4194. Hymenoptera, 4142.
Aquatilia. Cataclysta, 3745. Arzama, 3247.
Halophila. Ephydra, 3781.
Inquilines, 3349-3351, 3415. Lepidoptera, 3760. Cynipidae, 3454. Aulax, 3427.
Nidification. Araneina, 3517, 3561. Cteniza, 4285. Tegenaria, 4192. Hexapoda, 4195. Lepidoptera, 4086. Anaphe, 4193. Camponotus, 3240. Pelopoeus, 3536, 4149, 4193. Trypoxylon, 3536. Contopus, 4058.
Architecture. Formicidae, 4078. Atta, 3477. Apis, 4179.
Cocoons. Micaria, 4140. Cionus, 4080. Sciara, 3709. Lepidoptera, 3383, 4078. Bombycidae, 3667. Orgyia, 3616. Eunomia, 4149. Braconidae, 3345.
Egg-cases. Hexapoda, 4149, 4208.
Larva-cases, 4195. Coscinoptera, 3615. Oiketicus, 3993.
Mines. Lepidoptera, 3691, 3693, 3695.
Pupal retreats. Charagia, 4171.
591,53. Food-habits, 3687, 4166.
Vermes, 3119.
[Arachnida.] Acarina, 4086-4087, 4192. Tyroglyphus, 3599. Oribates, 3110. Araneina, 4064. Diapontia, 4136.
Hexapoda, 3113, 3527, 3604, 3645, 4101, 4191.
[Thysanura.] Podura, 3340. Campodea, 3613.
[Orthoptera.] Forficula, 4085. Locustidae, 4147. Gryllus, 3771.
[Pseudoneuroptera.] Breyeria, 3941. Libellula, 3834.
[Neuroptera.] Chrysopa, 3571.
Rhynchota, 3752, 3769, 3898. Kermes, 3326. Pulvinaria, 4086, 4223. Phylloxera [Dactylosphaera], 3637. Aphididae, 3323, 3547, 3885. Lachnus, 3111. Phymata, 3617. Anthocoris, 3571.
Coleoptera, 3319, 3586, 4044, 4149, 4206. Hylesinus, 3309. Pissodes, 3623. Phytonomus, 3325-3326. Otiorhynchus, 4142. Cantharis, 4154. Epicauta, 3771. Diabrotica, 3771. Doryphora, 3628. Gastrophysa, 3446. Coscinoptera, 3615. Zengophora, 3979. Spalacopsis, 3348. Hippopais, 3348. Purpuricenus, 3630. Chalepus, 3335. Ozognathus, 3416, 3501. Coraebus, 3737. Trogoderma, 4167. Coccinellidae, 3571. Carabidae, 4252.
Diptera, 4121. Trypeta, 3700. Cyrtoneura, 3516. Hemerodromia, 3546. Bombyliidae, 3520, 3680. Hirmoneura, 4141. Asilidae, 3158, 3420. Simulium, 4133. Pulicidae, 3293, 3778. Cecidomyia, 3319, 3428, 3609, 4286.
Lepidoptera, 3706, 4078, 4142, 4235, 4265. Bucculatrix, 3687. Cemiostoma, 3297. Batrachedra, 3698. Euclemensia, 3328. Gelechia, 4087. Prodoxus, 3378. Tortricidae, 3499. Retinia, 3702. Argyrolepia, 3669. Chilo, 3327. Dakruma, 3701. Panthea, 4175. Noctuidae, 3606, 4198. Catocala, 3269. Heliothis, 3307, 3389. Arzama, 3247. Gortyna, 3882. Ceratocampa, 4149. Callosamia, 4174. Oiketicus, 3993. Alypia, 3593. Sphinx, 3329. Smerinthus, 3143. Hesperiidae, 3688. Papilio, 3668. Gonepteryx, 3680. Pieris, 3322, 3491. Lycaenidae, 3628. Thecla, 3254. Melitaea, 3386. Danais, 3580.
[Hymenoptera.] Dolerus, 3813. Cynipidae, 3427. Chalcididae, 3291 *n*. Ichneumonidae, 3379. Formicidae, 4056. Pelopoeus, 4193. Stizus, 3964, 4087. Larra, 3291 *n*. Halictus, 3522. Andrena, 3680. Anthophora, 3680. Apis, 3879.
[Vertebrata.] Heterodon, 4087. Aves, 3832, 3960, 3966. Hydrochelidon, 3159. Ortyx, 3571. Phasianus, 4138. Sialia, 3961-3962. Sciurus, 4004.
Parasitism, 3345, 3349, 3372, 3397, 3422, 3448, 3450, 3566-3569, 3576, 3749, 4207, 4218, 4262. Infusoria, 4178. Gregarina, 3736. Vermes, 3119. Nematoda, 4086, 4247. Sphaerularia, 4133. Seus, 3107. Trichodectes, 3312. Hornia, 3667. Leucopis, 3759. Cyrtoneura, 3516. Lucilia, 4272. Oestridae, 3998, 4086-4087, 4139. Bombyliidae, 3291 *n*.

Hirmoneura, 3397. Diplosis, 3726, 3728, 3759. Lepidoptera, 4149. Dakruma, 3706. Hymenoptera, 3338. Pteromalus, 3115. Spalangia, 3115-3116. Coccophagus, 3105. Antigaster, 3598. Callimome, 3396. Eurytoma, 3427. Platygaster, 4201. Telenomus, 3886. Anisopelma, 3890. Ichneumonidae, 3384. Ophion, 3674. Polysphincta, 3364. Acrodactyla, 3286. Phaeogenes, 3262. Coelioxys, 3815.

591,54. Phaenology.

Seasons. Cecidozoa, 3351. Hexapoda, 3442, 3835. Corydalus, 3506. Coleoptera, 3952. Asphondylia, 3399. Cecidomyia, 3929. Microlepidoptera, 3693. Papilio, 3135. Feniseca, 4197. Lycaena, 3845. Vanessa, 3503. Diastrophus, 3427.

Abundance. Gordius, 3291 *n*. Trombidium, 3291 *n*. Hexapoda, 3663. Polymitarcys, 3317. Aphididae, 4067. Blissus, 3402. Saperda, 3128. Cupes, 3142. Coccinellidae, 3581. Chlorops, 3134. Lepidoptera, 3154, 3299, 3464. Pieris, 4013. Terias, 3157.

Daily habits. Lepidoptera, 4045. Eudamus, 4221.

Hibernation. Larvae, 4126. Buprestidae, 3630. Bucculatrix, 3612. Walshia, 3339. Plathypena, 3324. Limenitis, 3574. Argynnis, 3258.

Seasonal migration. Acridiodea, 3291 *d*. Termitina, 4191. Aphididae, 3323.

Number of generations in the year [Goneuty]. Tineina, 3910. Bombycidae, 3659. Vanessa, 3503. Brenthis, 3274, 3277.

Periodicity. Hexapoda, 3571, 4110. Cicada, 3577. Notodonta, 3304.

Proterandry and proterogyny. Lepidoptera, 3845.

Comparative abundance of sexes. Xenos, 3601. Hymenoptera, 4062.

591,55. Social habits.

Myrmecophila, 4187. Aphididae, 3437. Publilia, 4056. Lycaenidae, 4070.

Slavery, 3435.

Swarms [*see also* **59154, 5919**]. Atropos, 4086. Libellula, 3161, 4033. Melolontha, 3777. Atherix, 4149. Papilio, 3668. Callidryas, 4139. Danais, 3130, 3580.

591,56. Breeding habits.

Attraction of sexes. Prionus, 4102. Saturnia, 3485. Heliconia, 3252.

Copulation. Acarina, 3939. Tegenaria, 4190. Hexapoda, 3534. Dytiscus, 3939.

Oviposition. Sialis, 3521. Corydalus, 3506, 3535. Bombyliidae, 3520. Mallophora, 3291 *n*. Cecidomyia, 3430, 3557. Gelechia, 4087. Crambus, 3311. Noctuidae, 3430. Argynnis, 4058. Nematus, 4199. Biorhiza, 3891.

Care of young. Hexapoda, 3583. Hymenoptera, 3429.

591,57. Means of protection.

Protective habits. Hexapoda, 3465, 3770, 4284.

Protective mimicry [*see also* **591155**], 3767, 4149.

Protective coloration [*see also* **591157**]. Hexapoda, 3437, 4031.

Protective secretions and excretions [*see also* **591144**]. *Faeces*, 3578. *Lac*, 3555.

Immunity from enemies. Lepidoptera, 3620, 3624.

Stinging. Apis, 4219.

591,59. Other biological relations.

Behavior towards colors. Hexapoda, 3924, 4191. Lepidoptera, 3389, 4265.

Behavior towards light. Hexapoda, 3295. Lepidoptera, 3370, 3423, 4239.

Behavior towards odors. Aphididae, 3885.

Behavior towards weather. Hexapoda, 3295, 3571, 4260. Lepidoptera, 3889. *Floods.* Coleoptera, 4284. *Temperature.* Gryllus, 3936. *Winds.* Aletia, 3831.

Natural limitations of abundance, 3573, 3578.

RELATIONS WITH PLANTS.

Mutual relations of animals and plants. Cecidozoa, 3351, 3353. Hexapoda, 3742. Cynipidae, 3427. Apis, 3440. *Fungi.* Hexapoda, 4286. Cecidomyia, 4162.

Pollination of plants by animals. Hexapoda, 3239, 3476, 3564. Hymenoptera, 3440, 3558, 3563.

Modifying influence of animals upon plants. Hexapoda, 3439.

STATISTICS. Doryphora, 3466.

Number of genera and species. Hydrobiini, 3118.

591,6. ECONOMIC ZOOLOGY.

Passer, 4137. *Economic entomology*, 3716.

591,609. History, 3146, 3407.

591,61. Usefulness of animals. Oribates, 3110. Hexapoda, 3109. Corydalus, 3535. Coccophagus, 3105. Leucania, 3582. Aves, 3960-3962.

591,62. Usefulness in nature. *As plant-pollinators.* Andrena, 3680. *As natural checks*, 3350. Formicidae, 4058. Aves, 3715. *As disseminators.* Coleoptera, 3369. *As scavengers.* Coleoptera, 4292.

591,63. Direct usefulness.

As food, 3836. Hexapoda, 3152, 3544. Acridiidae, 4181. Diptera, 3781. *Honey*, 4183. Aphididae, 4095. *Manna*, 4182, 4191.

As medicine. Blatta, 4234. Meloidae, 3578, 3973, 4154. Doryphora, 3529. Formicidae, 3633, 4280.

591,64. Usefulness in arts and commerce. *For lac*, 3555, 3703. *For wax*, 3707.

591,65. Noxiousness of animals.

591,66. Direct noxiousness.

As carriers of contagion. Diptera, 3544.

As hosts of parasites. Diptera, 4138.

As parasites, 3566-3567, 3569, 3576. Diptera, 3361, 3505, 4120. Lucilia, 4272. Dermatobia, 4139. *Phthiriasis*, 3631. Acarus, 4138.

As pests, 3544.

As poisonous animals. Doryphora, 3578. *Stingers.* Cicada, 3577. Sphinx, 3578. *Urticators.* Lepidoptera, 3461.

As terrors. Ceratocampa, 3579.

591,67. Noxiousness by injuring inanimate objects. Formica, 4087. *Glass.* Termitina, 4245. *Grain.* Tinea, 3430.

591,68. Noxiousness by injuring living plants [*see also* **58129** *and* **59153**], 3578, 3976, 4298. Acridiodea, 3291 *b, i, m*, 3487. Pachytylus, 3291 *u*. Rhynchota, 3752. Chloroneura, 3546. Cicada, 3577. Blissus, 3402, 3571. Sphenophorus, 3310, 3321. Lissorhoptrus, 3335, 3348. Phytonomus, 3309. Phyllotreta, 3554, 3584. Saperda, 3899. Chalepus, 3331, 3335. Lachnosterna, 3876. Agrilus, 3447. Drosophila, 3714. Trypeta, 3700. Sciara, 3709. Cecidomyia, 3474. Lepidoptera, 4090. Tineina, 4194. Eudemis, 3573. Tortrix, 3956. Crambus, 3334. Chilo, 3332. Pempelia, 3346. Nephopteryx, 3996. Anisopteryx, 3616. Noctuidae, 3718. Heliothis, 3882. Aletia, 3614. Leucania, 3582. Attacus, 3592. Orgyia, 3616, 3646.

Nola, 3347. Sphinx, 3308. Macrosila, 3718. Alypia, 3593. Dolerus, 3313. Isosoma, 3770.

CECIDOZOA, 3417, 3419-3420, 3426, 3454, 3738. Acarina, 3421, 3451. Psylla, 3724, 3727. Pachypsylla, 3728. Trypeta [Acinia], 3450. Sciara, 3709. Cecidomyia, 3409, 3411, 3414, 3428, 3451-3454. Gelechia, 3446. Cochylis, 3450. Rhodites, 3422, 3429, 3448-3449. Diastrophus, 3427. Cynips, 3416, 3501.

591,69. Noxiousness by injuring living animals [*see also* **59129** *and* **59153**], 3715. Trichodectes, 3312. Phymata, 3926. Diptera, 3544. Oestridae, 3998, 4149. Simulium, 4131.

591,7. ANIMAL ANATOMY.

Anatomical nomenclature, 3508, 3684, 4231.

Anatomy, 3131. Arthropoda, 3871. Limulus, 4300. Acarina, 3560. Demodex, 3823. Hydrachnidae, 3999. Araneina, 3561. Theridiidae, 3728. Epeiridae, 3948. Scorpio, 4300. Scolopendrella, 3139. Hexapoda, 4179. Macrotoma, 4062. Caloptenus, 3508. Anabrus, 3291 *i*. Psocidae, 4163. Embiidae, 4300. Corydalus, 3511, 3513, 3521, 3531-3533. Trichoptera, 3480. Cerococcus, 3707. Aphididae, 3504, 3590. Tenebrionidae, 3972. Eleodes, 3971. Coscinoptera, 3615. Melolontha, 3131. Hypotrichia, 4170. Hydrophilidae, 4043. Harpalus, 4005. Piophila, 3560. Oestridae, 4075. Pulicidae, 4053. Lepidoptera, 3981, 4106-4107. Oedematophaga, 4278. Hymenoptera, 3583, 3901. Grotea, 3805. Pompilidae, 3818. Apidae, 3796. Apis, 3337.

Organs of doubtful nature. Acridiidae, 3632.

591,71. Anatomy of circulatory organs.

591,72. Anatomy of respiratory organs. Arachnida, 3881. Myriopoda, 3377. Scutigera, 4054. Corydalus, 3534-3535. Drosophila, 3711, 3714. Trypeta, 3700. Cataclysta, 3745. *Air-sacs*. Acridiidae, 3291 *j*. *Gills*. Larvae, 4209. *Stigmata*. Hexapoda, 4087. Elater, 4147.

591,73. Anatomy of nutritory organs. Tenebrio, 3510. Apis, 3337.

INTESTINE. Araneina, 4019. *Excrement*. Sphinx, 4086.

MOUTH-PARTS. Gamasidae, 3292. Hexapoda, 3242, 3467, 3631. Diptera, 3489. Bombyliidae, 3536. Blepharoceridae, 3443. Tineina, 3686. Pempelia, 3346. Apis, 4149. *Breast-bone*. Cecidomyia, 3411. *Mandibles*. Odontolabidae, 4122. *Palpi*. Microlepidoptera, 3697-3698. *Tongue*. Apis, 4193.

591,74. Anatomy of secretory and excretory organs.

GLANDS. Hexapoda, 3734, 4083. *Coxal*. Phalangiidae, 4017, 4019. Galeodes, 4018. *Tarsal*. Hexapoda, 3939. *Tibial*. Hepialus, 3678.

591,742. CONSTRUCTIVE. *Silk glands*. Telea, 3674.

591,743. DIGESTIVE. *Salivary glands*. Apidae, 3337, 4118.

591,744. ATTRACTIVE, DEFENSIVE AND OFFENSIVE. *Foramina repugnatoria*. Glomeris, 3721. *Odoriferous organs*. Hepialus, 3678. *Osmateria*. Papilio, 4058.

591,745. POISONOUS. Hymenoptera, 3685.

591,746. GENERATIVE. Tegenaria, 4190.

561,748. EXCRETORY. *Malpighian vessels*. Tinea, 3690.

591,76. Anatomy of generatory organs. *Genitalia*. Coraebus, 3737. Lepidoptera, 4082. Prodoxidae, 3462. *Ovaries*. Hexapoda, 3388. *Oviduct*. Coccinae, 3708.

591,77. Anatomy of motory organs.

LEGS. Hexapoda, 3937. Tineina, 3686. *Tarsi*. Hexapoda, 3939.

MUSCLES. Apis, 3684.

STRIDULATING ORGANS. Coleoptera, 4249.

WINGS. Diptera, 3101. Attacus, 4084. Urocerus, 3791. *Neuration*. Blattariae, 4087. Psocina, 3279. Chloroneura, 3546. Anthrax, 3779. Lepidoptera, 3697-3698. Pompilidae, 3818. Nomada, 3816. Coelioxoides, 3796. *Rudimentary wings*. Niptus, 3940. *Aptera*. Lepidoptera, 4176.

591,78. Anatomy of sense organs and nervous system. Corydalus, 4180. Hymenoptera, 3358. *Antennae*. Pempelia, 3346. *Auditory hairs*. Arachnida, 3824. *Brain*. Caloptenus, 3137-3138, 3291 *l*. *Eyes*. Arthropoda, 3880. *Olfactory organs*. Arthropoda, 3872. Apis, 3337. *Tactile organs*. Arthropoda, 4258.

591,79. Anatomy of integument and dermoskeleton. *Luminous organs*. Lampyridae, 3589. *Segmental organs*. Odonata, 4084. *Sonorific organs*. Sphingidae, 3308.

HEAD. Musca, 4210. Blepharocera, 3455.

THORAX.

ABDOMEN. Acarina, 3737.

APPENDAGES. *Anal appendages*. Panorpidae, 3483. Lepidoptera, 4061. *Evaginable organs*. Acherontia, 3597. *Hairs*. Coleoptera, 3682. Bombycidae, 3918. Hymenoptera, 3502. *Scales*. Coleoptera, 4119. Lepidoptera, 3230. *Spines*. Lepidoptera, 3461.

591,8. ANIMAL HISTOLOGY.

Invertebrata, 3869. Hexapoda, 3291 *k*. Macrotoma, 4062.

591,81. Histology of circulatory organs. *Dorsal vessel*. Hexapoda, 3729.

591,82. Histology of respiratory organs. Arachnida, 3881.

591,84. Histology of secretory and excretory organs. *Coxal glands*. Galeodes, 4018. *Salivary glands*. Apidae, 3337. *Genital glands*. Hexapoda, 3500. Tinea, 4128. *Malpighian tube*. Arthropoda, 3789.

591,87. Histology of motory organs. *Rectal muscles*. Lepidoptera, 4086.

591,88. Histology of sense organs and nervous system. *Brain*, 3261 *l*. *Eyes*. Arthropoda, 3877. Diptera, 4279.

591,89. Histology of integument and dermoskeleton. *Scales*. Coleoptera, 4119.

591,9. GEOGRAPHICAL DISTRIBUTION.

Potato-pests, 3578. Epeiridae, 3948. Anabrus, 3291 *i*. Odonata, 3239. Chrysomphalus, 3600. Coleoptera, 3309, 3331. Prionus, 3572. Helota, 4149. Tropisternus, 4043. Amphizoa, 4058. Trypeta, 3700. Lucilia, 4272. Blepharoceridae, 3519. Cecidomyia, 3473, 3666. Lepidoptera, 3983, 4020, 4122. Deuterocopus, 4149. Tortricidae, 3953. Nephopteryx, 3996. Scoliopteryx, 3980. Sphinx,

3306, 3329. Papilio, 3668, 3923. Parnassius, 4149. Lycaena, 3844. Nymphalidae, 3848. Grapta, 3860. Satyrus, 3837. Hymenoptera, 3901. Cynipidae, 3622. Gasteruption, 4041. Pelopoeus, 4193. Larridae, 4011-4012. *Cosmopolitan species.* Hexapoda, 4149. *Limits of faunal regions,* 3775, 4122.

Habitat. Acridiidae, 3291 *d, g.* Blissus, 4103. Coleoptera, 3586. Hydrobiini, 3118. Eristalis, 3232. Cecidomyia, 3929. Catocala, 3935, 4132. Melitaea, 4052.

Immigration [introduction or spread of species]. Hexapoda, 3947. Phylloxera, 4142. Doryphora, 3713. Diptera, 4025. Pulex, 4093. Danais, 4149.

Migration: Flights [*see also* **59155**]. Hexapoda, 3296. Acridiidae, 3291 *d, e, f, h.* Pachytylus, 3291 *u.* Odonata, 4193. Libellula, 3878, 4140. Pieris, 3126, 3322.

FAUNAE,

3291 *s*, 3487, 4149.

591,94. Fauna of Europe, 3145, 3309, 3325, 3430-3431, 3444, 3455, 3473, 3480, 3610, 4020, 4176. Iceland, 3370. Sweden, 3279, 3397, 4090, 4218. Finland, 3279. Russia, 4140. Germany, 3184, 3161, 3878, 4141-4142, 4165, 4250. Great Britain, 3541, 3621, 3639, 3901, 4130. Scotland, 3457, 3644. England, 3299, 3464, 3581, 4292. Wales, 3503. France, 3450, 3902, 4082. Spain, 3291 *u.* Switzerland, 3999. Austria, 4013, 4083. Sicily, 3140 4142.

591,95. Fauna of Asia. Assam, 4029, 4298. Ceylon, 4299. Farther India, 3445, 3958, 4029, 4128, 4191. China, 3445.

591,96. Fauna of Africa, 3259, 3544, 4093, 4147. Madagascar, 4299. Natal, 4193. Caffraria, 4299. Niger, 4300.

591,97. Fauna of North America [in general, nearly all the paragraphs], 3118, 3280, 3283, 3356, 3413, 3494-3498, 3622, 3626-3627, 3638, 3649, 3730-3733, 3780, 3782-3784, 3793, 3796-3799, 3801-3803, 3805-3806, 3812-3818, 3822, 3837, 3840-3844, 3848-3854, 3858, 3904-3913, 3938, 3948, 3953, 3973, 4009, 4020, 4025, 4101, 4122.

British America, 3241. Labrador, 3696. Hudson's Bay, 3775. Ontario, 3120, 3130, 3142, 3660-3661, 4136. Manitoba, 3713, 4193.

United States, 3278-3279, 3281, 3291 *r*, 3309, 3328, 3387, 3463, 3548, 3696, 3846, 3855, 3868, 3930, 3946, 3955, 3963, 3988-3989, 4046.

Eastern United States, 3311, 3596, 3723, 4087. Maine, 3956. New Hampshire, 3588, 3629. Vermont, 4000. Massachusetts, 3225, 3381, 3595, 3809, 3896, 3915, 3984, 4002-4003, 4081, 4103, 4116, 4220, 4274. Rhode Island, 4139. Connecticut, 3232, 3626, 3928. New York, 3249, 3272, 3309, 3325-3326, 3506, 3613, 3616, 3619, 3646, 3833, 3839, 3978, 3990, 3997, 4004, 4035, 4039, 4050, 4083, 4103, 4142, 4197. New Jersey, 3929. Pennsylvania, 3966. Maryland, 4206. District of Columbia, 3249, 4081. West Virginia, 3809, 3845. Kentucky, 3481. Ohio, 3127, 3157, 3222, 3270, 3313, 3414, 3952. Illinois, 3220, 3263, 3312, 3426, 3669, 3864, 3883, 4140. Michigan, 3927, 4142. Lake Superior, 3512. Wisconsin, 3669. Minnesota, 3317. Iowa, 3386, 3865-3866. Missouri, 3290, 3402, 3582.

Western United States, 3291 *q.* Kansas, 3232, 4047, 4272. Nebraska, 3588. Colorado, 3228, 3792, 3795, 3807, 3903, 3942-3943, 3987, 3991-3992, 4048, 4087. Montana, 3857.

Pacific States, 3215-3217, 3249, 3265. Idaho, 3291 *v.* Washington Territory, 3223, 3232, 4052. Oregon, 3214, 3248, 3287, 3483. California, 3214, 3248, 3291 *m, n*, 3483, 3781, 3794, 3804, 3847, 3879, 3982, 4089, 4285, 4299. Nevada, 3781. Utah, 3291 *r*, 3417. Arizona, 3229, 3248, 3255, 3273, 3844, 4051. New Mexico, 3264, 3291 *g*, 3791, 3983, 4049.

Texas, 3102, 3156, 3220, 3249, 3291 *t*, 3477, 3808, 3811, 3838, 3894, 3943, 3985-3986, 4272. Indian Territory, 3291 *t*. Arkansas, 4181. Louisiana, 4284. Alabama, 4136. Georgia, 3220, 3659. South Carolina, 3126, 3322. Florida, 3106-3109, 3111-3116, 3225, 3249, 3252-3253, 3272, 3433, 3492, 3598, 3600, 3688, 3847, 3856, 3867, 3986, 3997.

West Indies, 3133. Cuba, 3268, 3810, 3819. Dominica, 4299.

Mexico, 3278, 3280-3281, 3445, 3790, 3800, 3900, 4284. Lower California, 3248, 3804.

Central America, 3459. Guatemala, 3458. Veragua, 4057. Panama, 3830.

591,98. Fauna of South America, 3281, 4057. New Granada, 3445. Ecuador, 4123, 4299. Guiana, 3133, 3494-3498, 4265. Brazil, 3624, 3745, 3765, 3835, 3898. Uruguay, 4136. Argentine Republic, 3238, 3626-3627, 4275. Chili, 4025.

591,99. Fauna of Oceanica, etc. Australia, 3419, 3738, 4191, 4193, 4195. New Caledonia, 4195. New Zealand, 4134, 4144, 4173, 4299.

Sandwich Islands, 4025. Tahiti, 3281. Pitcairn I., 4291.

Arctic regions, 4110.

Special Zoology.

593. PROTOZOA; RADIATA.

593,15. Infusoria, 4178.

593,19. Gregarinidae. Sporozoa, 3736.

594. MOLLUSCA.

594,1. Lamellibranchiata. Mytilus, 3122.

595. ARTICULATA.

595,01. Philosophy of entomology. Difficulties, 3790. Importance, 3350, 3716. Need of large series of specimens, 3387. Problems, 3132. Significance of characters, 3780; of eggs, 3461.

595,03. Dictionaries [*see also* **570,3**].

NOMENCLATORS. Vernacular names, 3431, 3570, 3579, 3667.

ORISMOLOGY, 3508. Eyes, 3877. Muscles, 3684. Wings, 3916.

595,04. Essays, 3650, 3716. Miscellanea, 4130-4146. Notices, 3862. [*For* Elementary and popular writings, *see* **595,07.**]

595,05. Periodicals, 3873.

595,054. EUROPEAN, 3651-3658. Annuaire entom., 3651-3658. Entom. tidskr., 3873. Rovaraszati lapok, 4105. Rovartani lapok, 4112, 4282.

595,057. NORTH AMERICAN. Papilio, 4136. Psyche, 4078, 4114, 4140, 4217, 4227, 4229.

595,06. Societies. [*See also* **506, 5706, 5906**], 4273.

595,064. EUROPEAN, 3651-3658. Entom. för. i Stockholm, 4070. Entom. soc. Lond., 4142, 4147-4149, 4172, 4293. Lancashire and Cheshire entom. soc., 4131. Northern entom. soc., 4131. Iris, 4142. Soc. entom. France, 4120, 4127, 4132, 4138, 4185, 4253.

595,067. NORTH AMERICAN, 4078, 4244, 4273. A. A. A. S.—Entom. subsect., 3125, 3132, 3252, 3258. Amer. entom. soc., 3792, 3796-3798, 3801-3802. Brooklyn entom. soc., 3283. Cambr. entom. club, 4078-4087, 4098, 4134, 4136, 4212-4213, 4215, 4221, 4269. Entom. club A. A. A. S., 3594, 3650, 3670, 3862, 3949-3951, 4129. Entom. soc. Ontar., 3146, 4108. Entom. soc. Wash., 4150, 4220. Rhode Island entom. soc., 4139.

595,07. Education [*see also* **507, 5707, 5907**]. Elementary information, 3144, 3147-3150, 3296. Entomological ignorance, 3324, 3431, 3578. Exhibitions, 4135. Expeditions, 4122. Methods of study, 3508, 3932, 3951, 3976. Museums, 3710, 4289. Prizes, 4106-4106. Schools, 4153.

595,09. History [*see also* **016,595**], 3132, 3146, 3650, 3862, 3950-3951, 4149, 4151.

Demodex, 3823. Neuroptera, 3591. Prosopistoma, 3479, 3482. Blissus, 3402, 3571. Phytonomus, 3309. Diptera, 3489. Bombyliidae, 3536. Cecidomyia, 3609, 3473, 3689, 4161. Tortricidae, 3954, 3956. Aletia, 3570.

595,1. VERMES,

3119, 3566, 3569, 4177.

595,15. NEMATODA,

4086, 4247.

Sphaerulariidae. Sphaerularia, 4087, 4133, 4191. Simondsia, 4191.

Strongylidae, 4147.
Gordiidae. Gordius, 3291.

595,19. ANNELIDA.

Lumbricidae. Lumbricus, 4149.
Nereidae. "Geophilus proavus," 4269.

595,2. ARTHROPODA,

[*see also* **595,3-595,7**], 3471, 3544, 3871-3872, 3959.

595,3. CRUSTACEA,

4269.

595,34. COPEPODA.

Cyclopidae. Cyclops, 4201.

595,37. ISOPODA.

3880. Oniscoda, 4138.

595,38. DECAPODA.

Potamophilus, 4209.

595,39. POECILOPODA.

Limulidae. Limulus, 3471, 3877, 3881, 4300.

595,4. ARACHNIDA,

3471, 3767, 4019. Fossil, 4086.

595,41. STELECHOPODA.

Linguatulidae. Pentastoma, 3566, 3569.

595,42. ACARIDA,

3421, 3568-3569, 3893, 4192.

595,421,2. **Phytoptidae**, 3753. Phytop[illegible] 4177.

595,421,4. **Demodicidae**. Demodex, 3823.

595,421,6. **Sarcoptidae**, 3749, 3768. Aca[illegible] 3109, 3421, 3560, 3576, 4138.

595,422. **Tyroglyphidae**, 4192. Typhlodrom[illegible] 3109. Tyroglyphus, 3599, 3737.

595,423. **Gamasidae**, 3292. Sejus, 3107.

595,424. **Oribatidae**. Oribates, 3110.

595,425. **Ixodidae**, 3749. Ixodes, 4119.

595,428. **Hydrachnidae**, 3999. Hydrach[illegible] 3560.

595,429. **Trombidiidae**, 3705. Trombidi[illegible] 3291, 4016, 4019, 4078.

595,43. ARANEIDA,

3286, 3364, 3517, 3561, 3730-3733, 3828, 4064, 4[illegible] 4097, 4299.—Aranea, 4269.

595,431. SALTIGRADAE.

Attidae, 4009. Salticus, 4119. Attus, 4097.

595,432. CITIGRADAE.

Lycosidae. Dolomedes, 4166. Tarentula, 312[illegible] Diapontia, 4136.

595,433. LATERIGRADAE.

Thomisidae, 3732.

595,434. TERRITELARIAE.

Theraphosidae, 4285.

595,436. TUBITELARIAE.

Drassidae. Micaria, 4140. Clubiona, 4119
Agalenidae. Tegenaria, 4190, 4192.

595,437. RETITELARIAE.

Theridiidae, 3723. Theridium [Theridion], 4119.

595,438. ORBITELARIAE.

Epeiridae, 3948. Zilla, 4097. Epeira, 4058, 4119.—Arachnoura, 4299. Epeiroides, 4009.

595,45. PHALANGIDA.

Phalangiidae, 4017, 4019. Phalangium, 3561.

595,46. SCORPIONIDA.

Scorpionidae. Scorpio, 3877, 4300.
Androctonidae. Buthus, 4082.

595,47. ANTHRACOMARTI.

Architarbidae. Anthracomartus, 4085-4086.

595,48. PEDIPALPI,

[illegible]86.

595,49. SOLIFUGAE.

Solpugidae, 4104. Galeodes, 4018.

595,5. ONYCHOPHORA.

Peripatidae. Peripatus, 3133, 4269.

595,6. MYRIOPODA,

[illegible]69.

595,61. ARCHIPOLYPODA,

[illegible]524 (4080).

595,64. DIPLOPODA.

Glomeridae. Glomeris, 3721.
Iulidae, 3930. Iulus, 3789.
Polizonidae, 3930.

595,67. CHILOPODA.

3377.
Geophilidae. Geophilus, 3764, 3788, 4282.
Lithobiidae. Lithobius, 4247, 4282.
Scutigeridae. Scutigera, 4054.

595,69. SYMPHYLA.

Scolopendrellidae. Scolopendrella. 3139.

595,7. HEXAPODA,

[in general, nearly all the paragraphs], 3290, 3295, 3372, 3395, 3403, 3415, 3419, 3425, 3430, 3437, 3458, 3468, 3490, 3492, 3500, 3568, 3571, 3604, 3645, 3651-3658, 3767, 3828, 3937, 4101, 4119, 4205, 4209, 4228, 4257, 4286. — Archaeoptilus, 3541. Brodia, 3541. Lithosialis, 3541.

595,71. THYSANURA,

3139, 3377, 4076.
595,712. **Poduridae.** Podura, 3340, 4119. Degeeria, 3613. Choreutes, 3221. Tomocerus (Macrotoma), 4062.
595,716. **Campodeidae.** Campodea, 3613.
595,718. **Lepismatidae**, 4076, 4119.

595,72. ORTHOPTERA.

595,722. FORFICULODEA.

Forficulidae. Forficula, 4085.

595,724. BLATTODEA.

Blattinidae. Etoblattina, 3275.
Periplanetidae. Blatta, 3500, 3872, 3934, 4178, 4234. Periplaneta, 3736.

595,725. MANTODEA.

Mantidae. Mantis, 4149.

595,726. PHASMODEA.

Phasmidae. Dictyoneura, 3681. Titanophasma, 4079.

595,727. ACRIDIODEA.

3291, 3487.
Truxalidae. Stenobothrus, 3872.
Acrididae, 3632, 4181. Pezotettix, 3470. Caloptenus, 3137-3138, 3296, 3470, 3508, 3679, 3748, 3754, 4231, 4259.

595,728. LOCUSTODEA.

Phyllophoridae. Microcentrum, 3598.
Conocephalidae. Conocephalus, 4100.
Decticidae. Anabrus, 3291.
Rhaphidophoridae. Hemideina. 4171.

595,729. GRYLLODEA.

Gryllidae, 3291*w*. Gryllotalpa, 3789, 3884, 4178. Gryllus, 3771, 3936. Myrmecophila, 4081, Oecanthus, 4134.

595,73. PSEUDONEUROPTERA,

3276, 3591.

595,731. ANOPLURA.

Mallophaga, 3568, 3576, 3749. Goniocotes, 3500. Lipeurus, 3500. Trichodectes, 3312.

595,732. PHYSOPODA.

Thripidae. Thrips, 4286.

595,733. CORRODENTIA.

595,734. **Termitina**, 3542, 4178, 4191, 4245 Termes, 3544.

595,736. **Psocina**, 3279, 4163. Atropos, 3611, 4055, 4086.

595,738. AMPHIBIOTICA.

595,738,1. **Ephemerina**, 3459, 3479. Prosopistoma, 3482, 4209. Ephemerella, 4042. Ephemera, 4195, 4209. Polymitarcys, 3317. Oligoneura, 3317. Palingenia, 3941. — Breyeria, 3941.
595,739. ODONATA, 3239, 4136.
595,739,1. **Libellulina**, 3834. Diplax, 3967. Libellula, 3158, 3161, 3878, 4033, 4140, 4209. Pantala, 4149.
595,739,8. **Agrionina**. Pyrrhosoma, 4141.

595,74. NEUROPTERA.

595,740,3. DICTIONARIES. *Indices*. Trichoptera, 3480.

595,741. PLANIPENNIA.

595,742. **Sialina**, 3506, 3521, 3535, 4083. Corydalus, 3360, 3507, 3511, 3513, 3531-3535, 3550, 3667, 4140, 4153, 4180, 4200, 4216.
595,744. **Hemerobina**. Dilar, 3481. Chrysopa, 3571, 3872.
595,746. **Panorpina**, 3483. Panorpa, 4200. Bittacus, 3843.

595,748. TRICHOPTERA,

3480.

Hydropsychidae, 3915.

595,75. RHYNCHOTA,

3752.

595,751. PARASITA.

595,751,4. **Pediculidae**, 3568, 3576, 3749. Phthirius, 4119. Pediculus, 3631.

595,752. HOMOPTERA,

3553.

595,753,2. **Coccidae**, 3472, 3599, 3670, 3705, 3707, 3769, 4094. *Coccinae*, 3708. Dorthesia, 3410. Rhizococcus, 4144. Carteria, 3703. Kermes, 3328. *Lecaninæ*. Lecanium, 3105, 3109, 3594, 3670. Pulvinaria, 3706, 4086, 4223. *Diaspinae*. Aspidiotus (Chrysomphalus), 3110, 3600, 3927.
595,753,4. **Aleurodidae**. Aleyrodes, 4199.
595,753,6. **Phylloxeridae** [Dactylosphaeridae], 3553. *Chermesinae*. Phylloxera [Dactylosphaera, Viteus, Pemphigus], 3637, 3724, 3726-3728, 3759, 3761, 3769, 4071, 4081, 4200, 4250-4251. Chermes, 3755-3756. *Pemphiginae*, 3323. Hormaphis [Hamamelistes], 3769. Pemphigus [Glyphina], 3349, 3927, 4004; [Eriosoma, Schizoneura], 3547, 4071.
595,753,7. **Aphididae**, 3113, 3323, 3349, 3435, 3504, 3547, 3590, 3769, 3885, 4065, 4095, 4177, 4259. *Lachninae*. Lachnus, 3111. *Aphidinae*, 4119. Aphis, 3113, 4065.
595,753,9. **Psyllidae**, 3728, 3761, 4014, 4203. Psylla, 3724, 3727, 3836.
595,754,2. **Tettigonidae**, 3280. *Jassinae*, 3546. Jassus, 3278. *Tettigoninae*. Gypona, 3281.
595,754,4. **Membracidae**. Publilia, 4056. Enchophyllum, 3410.
595,754,5. **Cercopidae**, 4195.
595,754,7. **Fulgoridae**. Flata, 4149.
595,754,9. **Cicadidae**, 3238. Cicada, 3431, 3577, 3903, 3927, 3964, 4259.

595,755. HETEROPTERA.

595,756,2. **Corisidae**. Corixa, 4086, 4259.
595,756,3. **Notonectidae**. Notonecta, 3467, 4086, 4119, 4259.
595,756,5. **Belostomatidae**. Belostoma, 3531-3534, 3550.
595,757,4. **Hydrometridae**. Hydrometra, 4119.
595,757,8. **Reduviidae**, 3576.
595,758,1. **Phymatidae**. Phymata, 3617, 3926.
595,758,42. **Acanthiidae** [Cimicidae] 3568. Acanthia, 3576. Cimex, 3631.
595,758,44. **Anthocoridae**. Anthocoris, 3571.
595,758,7. **Lygaeidae**. Blissus [Micropus], 3402, 3571, 3865, 3959, 4103, 4122.
595,758,8. **Berytidae**. Berytus, 4160.
595,759,2. **Pentatomidae**, 3445. Nezara, 4149. Brochymena, 3886.

595,76. COLEOPTERA.

3145, 3318, 3366, 3369, 3372, 3413, 3512, 3538, 3543, 3578, 3586, 3603, 3610, 3682, 3952, 4044, 4047, 4049, 4067, 4092, 4119, 4130, 4136, 4143, 4157, 4165, 4206, 4255, 4284.

595,761. RHYNCHOPHORA,

3118, 3213.
595,761,15. **Anthribidae**, 4142.
595,761,21. **Scolytidae**. *Scolytinae*. Hylesinus, 3309. Scolytus, 3546. Tomicus, 4291.
595,761,31. **Calandridae**. *Calandrinae*, 3310. Sphenophorus, 3321, 3716. Rhodobaenus, 4284.
595,761,51. **Curculionidae**, 4218, 4249. *Curculioninae*. Centrinus, 3319. Madarus, 3352. Baridius, 3352, 3578. Chalcodermus, 4284. Conotrachelus, 3442. Cionus, 4080. Anthonomus, 3350, 4249. Lissorhoptrus, 3335, 3348. Larinus, 4177. Eudocimus, 4284. Pissodes, 3623. Phytonomus, 3309, 3325-3326. *Apioninae*, 3413.
595,761,71. **Otiorhynchidae**. Otiorhynchus, 4142.

STREPSIPTERA.

595,762,11. **Stylopidae**, 3601.

COLEOPTERA GENUINA,

3213.
595,763,13. **Rhipiphoridae**. Rhipiphorus, 4207, 4262.
595,763,21. **Meloidae**, 3667, 3973. *Lyttinae*, 3578. Cantharis, 4154. Pomphopoea, 4035. Epicauta, 3291, 3771. Sitaris, 3437. Nemognatha, 4160.
595,763,27. **Anthicidae**, 4160.
595,763,31. **Mordellidae**, 4046.
595,763,63. **Lagriidae**. Statira, 4211.
595,763,7. **Tenebrionidae**, 3970-3972. Strongylium, 4211. Boletotherus [Bolitotherus], 4001, 4083. Alphitobius, 4292. Tenebrio, 3510, 4062. Eleodes, 3971, 4296.
595,765,1. **Bruchidae**, 3969. Bruchus, 3716, 3833, 4206.

595,765,2. **Chrysomelidae**, 4155-4156. Phyllotreta, 3554, 3584. Epitrix, 3578. Haltica, 3554, 3584. Diabrotica, 3747, 3771. Phyllobrotica, 3442. Doryphora, 3359, 3466, 3529, 3578, 3628, 3641-3642, 3713, 3865, 3927, 4061. Plagiodera, 4284. Gastrophysa, 3446, 3518, 3523, 4021-4022, 4246. Colaspis, 4155. Graphops [Scelodonta], 4155-4156. Paria, 4155. Coscinoptera, 3615. Crioceris, 3548. Lema, 3578, 3716. Zeugophora, 3979. Donacia, 4139.

595,765,3. **Cerambycidae**, 4206, 4284. Oberea, 3450. Saperda, 3128, 3899. Spalacopsis, 3319, 3335, 3348. Hippopeis, 3348. Strangalia, 3872. Xylotrechus, 3136. Purpuricenus, 3630. *Prioninae*, 3572. Prionus, 3153, 4102.

595,766,2. **Scarabaeidae**, 4170, 4249. Scarabaeus [Dynastes], 4160. Chalepus, 3319, 3331, 3335. Cyclocephala, 3331. Cotalpa, 4032. Polyphylla, 4102. Melolontha, 3131, 3777, 3872. Lachnosterna [Phyllophaga], 3865, 3876, 4207, 4262. Rhizotrogus, 3897, 4141. Amphicoma, 3896, 4039. Dasydera, 4039. Trox, 4249. Geotrupes, 4160. Onthophagus, 4086.

595,766,9. **Lucanidae**, 3963. Odontolabidae, 4122. Lucanus, 3147, 3534, 4085, 4253.

595,767,19. **Cupesidae**. Cupes, 3142.

595,767,2. **Ptinidae**, 3820. Anobium, 4055. Ozognathus, 3416, 3501. Eucrada, 3630. Ptinus, 3610. Niptus, 3940.

595,767,31. **Cleridae**. Corynetes [Necrobia], 4292.

595,767,35. **Malachiidae**, 3734.

595,767,4. **Lampyridae**, 3589. Chauliognathus, 3291, 4284. Lampyris, 3393-3394.

595,767,51. **Buprestidae**, 3352, 3602, 3630, 4206. Trachys, 4177. Coraebus, 3737. Agrilus, 3447. Acmaeodera, 3381. Chrysobothris, 4284. Dicerca, 4284.

595,767,6. **Elateridae**, 4249. Pyrophorus, 4068. Corymbites, 4206. Elater, 4147. Alaus, 3117, 3892, 4078. Tharops, 4206.

595,767,8. **Rhipiceridae**. Sandalus, 4206.

595,767,91. **Dascyllidae**, 3625.

595,768,13. **Parnidae**, 3625.

595,768,33. **Dermestidae**, 4119. Anthrenus, 4086, 4289. Trogoderma, 4167, 4288. Dermestes, 4292.

595,768,47. **Colydiidae**, 3463.

595,768,51. **Erotylidae**. Helota, 4149.

595,768,55. **Coccinellidae**, 3571, 3581, 3704, 3712, 4259.

595,768,69. **Paussidae**. Paussus, 4147.

595,768,71. **Staphylinidae**, 4157, 4275. Ocypus, 4149. Aleochara, 3619.

595,768,85. **Silphidae**, 4287. Silpha, 4038. Necrophorus, 4036.

595,768,95. **Hydrophilidae**, 3117, 3366, 3369, 3443. Hydrophilus, 3595.

595,769,1. **Gyrinidae**, 3603. Gyrinus, 3384.

595,769,2. **Dytiscidae**, 3608. Cybister, 4149. Dytiscus, 3478, 3939.

595,769,4. **Amphizoidae**. Amphizoa, 4058, 4259.

595,769,5. **Carabidae**, 3960, 4003, 4040, 4252, 4284. Selenophorus, 4002. Harpalus, 4005. Chlaenius, 4081. Patrobus, 4037. Nebria, 4087, 4259. Leistus, 3231. Calosoma, 3127, 4034, 4283. Carabus, 3789, 4149.

595,769,9. **Cicindelidae**, 4259, 4283, 4284. Cicindela, 3387, 3559, 3644, 3671-3672, 4000, 4040, 4119, 4160.

595.77. DIPTERA,

3101, 3489, 3735, 3738, 3760, 4120, 4121, 4188, 4279, 4295.

595,771,1. **Hippoboscidae**, 3568, 4279. Melophagus, 4075.

595,771,3. **Agromyzidae**. Leucopis, 3759.

595,771,4. **Oscinidae**. Chlorops, 3134.

595,771,6. **Drosophilidae**. Drosophila, 3711-3712, 3714, 4141.

595,771,7. **Ephydrinidae**. Ephydra, 3781.

595,771,9. **Piophilidae**. Piophila, 3560.

595,772,2. **Trypetidae**, 3450. Trypeta, 3400-3401, 3408, 3700, 3712.

595,773,1. **Anthomyidae**. Homalomyia, 4097.

595,773,3. **Muscidae**, 3476, 4279, 4297. Cyrtoneura [Curtoneura], 3516, 4120. Musca, 3872, 4210. Calliphora, 4069, 4081. Stomoxys, 3681, 4260. Glossina, 3631.

595,773,4. **Sarcophagidae**. Sarcophaga, 4025, 4119.

595,773,6. **Tachinidae**. Tachina, 3614. Exorista, 3582. Morinia, 4101.

595,773,9. **Oestridae**, 3568, 4075, 4121, 4259, 4279. Dermatobia, 3566, 4139. Cuterebra, 4086. Oestrus, 3576, 3917. Hypoderma, 3998, 4149. Gastrophilus, 3569, 3998.

595,774,2. **Conopidae**, 3233, 3784.

595,774,7. **Syrphidae**, 3115, 3476, 3489, 3780, 3782-3783, 4279. Eristalis, 3282, 4025. Syrphus, 3116, 4025. Pipiza, 3547. Nausigaster, 3782.

595,775,2. **Dolichopodidae**. Psilopus, 4025.

595,775,5. **Empidae**, 4279. Hemerodromia, 3546.

595,775,9. **Therevidae**, 4096.

595,776,2. **Bombyliidae**, 3291, 3520, 3536, 4279. Ploas, 4119. Bombylius, 3680. Anthrax, 3779.

595,776,4. **Nemestrinidae**. Hirmoneura, 3897, 4141.

595,776,5. **Mydaidae**. Apiocera, 4096.

595,776,6. **Asilidae**, 3782-3783, 4096, 4279. Asilus, 3158, 3420, 3631. Promachus, 3420. Mallophora, 3291.

595,777,1. **Leptidae**, 4279. Atherix, 4149.

595,777,3. **Tabanidae**, 3588, 3631, 4279. Tabanus, 3467, 3872, 4119.

595,778,2. **Tipulidae**, 4279.

595,778,6. **Psychodidae**. Phlebotomus, 3631.

595,778,8. **Chironomidae**, 4279. Tanypus, 4086. Chironomus, 3388, 3729, 4086, 4097.

595,778,9. **Culicidae**. Culex, 3544, 3631, 4025, 4082, 4086, 4119.

595,779,1. **Blepharoceridae**, 3443, 3455, 3519, 3939.

595,779,2. **Bibionidae**. Bibio, 3960.

595,779,3. **Simulidae**. Simulium, 3618, 3631, 4086, 4131, 4133.

595,779,4. **Pulicidae**, 3568, 3631, 3778, 4053, 4279. Sarcopsylla, 3544. Pulex, 3242, 3293, 3576, 3737, 4085, 4093.

595,779,5. **Mycetophilidae**. Sciara, 3709, 3712.

595,779,9. **Cecidomyidae**, 3349, 3464. Lasioptera, 3401, 3408. Asphondylia, 3396-3400. Cecidomyia, 3314, 3319, 3349, 3353, 3396-3400, 3409, 3411, 3414, 3428, 3430-3431, 3451-3454, 3473-3474, 3557, 3605, 3609, 3665-3666, 3689, 3716, 3743, 3929, 4161-4162, 4168, 4201, 4218, 4286. Diplosis, 3728, 3728, 3759, 4162.

595,78. LEPIDOPTERA,

3103, 3140, 3230, 3299, 3383, 3456, 3464, 3494-3498, 3525, 3545, 3578, 3648, 3760, 3776, 3785, 3888-3889, 3902, 3933, 3963, 4020, 4048-4049, 4061, 4082, 4090, 4130, 4142-4143, 4119, 4176, 4200, 4202, 4235, 4265, 4289, 4299-4300.—Anaphe, 4193. Mimallo, 3626.

595,780,3. DICTIONARIES OF LEPIDOPTERA. Catalogs, 3283.

595,781. HETEROCERA,

3121, 3370, 3626-3627, 3916.

595,781,1. ALUCITINA.

595,781,15. **Pterophoridae**, 3259, 3621.—Deuterocopus, 4149. Platyptilia, 3539.

595,781,2. TINKINA, 3686, 3691-3699, 3910, 3916, 4091.

595,781,3. **Lyonetidae.** Bucculatrix, 3612, 3687. Cemiostoma, 3297, 3911, 4232. Phyllocnistis, 3911. Lyonetia, 3912.

595,781,4. **Lithocolletidae.** Parectopa, 3913. Leucanthiza, 3911. Lithocolletis, 3686, 3904-3910.

595,781,5. **Elachistidae.** Tischeria, 3911. Heliodines, 4091. Walshia, 3339, 3418. Laverna, 3912. Batrachedra, 3350.

595,781,7. **Gracilariidae**, 3913. Gracilaria, 3898.

595,781,9. **Glyphipterygidae.** Aspidisca, 3122, 3693, 3912. Phigalia, 3983.

595,782,1. **Oecophoridae**, 3293.

595,782,3. **Gelechiidae**, 3694. Euclemensia, 3328. Anacampsis, 3905. Gelechia, 3446, 3450, 4091, 4259. Epigraphia, 3981, 3984.

595,782,6. **Hyponomeutidae.** Oeta, 3288.

595,782,7. **Prodoxidae**, 3378, 3412, 3424, 3462. Pronuba, 4200.

595,782,8. **Tineidae**, 3259. Tinea, 3430, 3690. 4128, 4160. Tineola, 3690.

595,782,9. **Choreutidae.** Choreutes, 3221.

595,783,1. TORTRICINA, 3696-3698.

595,783,2. **Tortricidae**, 3236, 3259, 3499, 3938, 3953-3954, 3956, 4152. *Grapholithinae*, 3288. Carpocapsa, 3442, 3922, 3927. Grapholitha, 4218. Eurytychia, 3343, 3401, 3408, 3418. Penthina, 3499, 3573. Eccopsis, 3259, 3955. Exartema, 3259. Eudemis, 3573. Retinia, 3702, 3763, 3953, 4078. Co[s]*chylinae*. Co[n]chylis, 3450. *Tortricinae*, 3219. Leptoris, 3698. Tortrix, 3288, 3956, 3990, 4177, 4218. Argyrolepia, 3594, 3669. Croesia [Pyrcholoma], 3990. Lozotaenia [Cacoecia], 3219.

595,783,4. **Crambidae**, 3327. Diphryx, 3332. Propexus, 3981. Crambus, 3311, 3334, 3696, 3719, 3981.

595,783,5. **Phycidae**, 3267. Dakruma, 3701, 3706, 3981. Pempelia, 3288, 3346, 3981. Pinipestis, 3988. Nephopteryx, 3998.—Catastega, 3693.

595,783,7. PYRALIDINA.

595,783,9. **Pyralididae**, 3738, 3981, 3989, 42 Cataclysta, 3745. Chrysendeton, 3983. Cindaph 3627. Pionea, 3865. Botis, 3264.—Acentropus, 41 Anaeglis, 3112.

595,784. GEOMETRINA.

595,784,7. **Phalaenidae** [Geometridae], 32 3246, 3283, 4031. *Larentinae*. Emplocia, 32 Eupithecia, 3212. Ypsipetes, 4247. Melanippe, 32 Lobophora, 4228. *Fidoninae*, 3249. Aspilates, 32 4031. Caterva, 3212. Abraxas, 4179. Panthe 4175. *Caberinae*. Deilinia, 3222. *Acidalii* Ephyra, 4031. *Boarminae*. Anisopteryx, 38 Hybernia, 4165, 4247. Eubyja, 3983. Biston, 416 Tephrosia, 3475. Cymatophora, 3261. Bombyci 3265. *Ennominae*. Ellopia, 3983. Azelina, 32 Eugonia, 4007.

595,785. NOCTUINA.

595,786,7. **Noctuidae**, 3245, 3264-3265, 328 3430, 3626, 3628, 3663, 3864, 3883, 3991-3992, 40 4048, 4050, 4091. *Hypeninae*. Platyhypena, 332 Pseudaglossa, 3989. *Toxocampinae*. Celiptera, 398 Phoberia, 3324. Synedoida, 3249. *Catocalina* 3249. Catocala, 3212, 3220, 3263, 3269, 3367, 384 3867, 3935, 3992, 4048, 4132, 4278. *Noctuophalaeni* Brephos, 4253. *Eustrotiinae*, 3626, 3986. Sprague 3226. Gyros [Oribates‖], 3249. Eustrotia [Erastria 3985. Chamyris, 3212. *Heliothinae*, 3264-32 Xanthothrix, 3248. Pyrrhia, 3991-3992. Helioth 3212, 3307, 3389, 3549, 3628, 3864, 3882. Rhod phora, 3465. Chloridea, 3626. Agrotis, 3585. *P siinae*. Plusia, 3154, 3248, 3266, 3288, 3606, 36 4007, 4119, 4130. Deva, 3224. [*H*]*abrostola*, 37 Diastema, 3497. Telesilla, 3719. *Anomiinae*, 32 3333, 3570, 3835. Aletia, 3324, 3516, 3614, 3831, 41 *Nolaphaninae*. Adipsophanes, 3719. *Cucullii* 3734. Cucullia, 3606. *Orthosiinae*. Xylina, 3266. S liopteryx, 3212, 3980. Trichorthosia, 3983. Ortho 3864. *Taeniocampinae*. Taeniocampa, 3365. *agriinae*, 3247. Leucania, 3582, 3734, 3865. N agria, 4078. *Hadeninae*, 3223-3224, 3983. Gort 3288, 3578, 3882, 3989, 3992, 4071. Hydroecia, 3 Euplexia, 4061. Prodenia, 3266. Laphygma, 3 3330. Polia, 3868. Hadena, 3265, 3986, 3 Aplecta, 3734. *Noctuinae*, 3983, 3989. Ulochlae 4176. Noctua, 3570, 3431, 4091. Agrotis, 3265-3 3991-3992, 4048, 4061. *Bombycoidea*. Chyton 3225. Bryophila, 3734. Apatela, 3212, 3989. ronycta, 3266, 4165. Audela, 3978. *Dicopin* Dicopis, 3225, 3864. *Bombycinae falsae*. Thyati 3265.

595,787. BOMBYCINA.

595,787,2. **Bombycidae**, 3283, 3667, 3675, 36 3918, 4149. *Hepialinae*, 4200. Hepialus, 3216, 36 Cossus, 3887. Xystus, 3244. *Lachneiinae*. Clis campa, 3244, 3282, 3865. Odonestis, 3787. Lasi campa, 4107. Cnethocampa, 3461, 3765. Glover 3248. Quadrina, 3264. *Ceratocampinae*, 3264, 39 Dryocampa, 3927. Ceratocampa, 3579, 4139. Cith ronia, 3579, 3659, 4274. Hyperchiria, 3627. Pseud hyzis, 3244, 3982. Euleucophaeus, 3248, 33 Hemileuca, 3244, 3273. Euc[h]ronia, 4086. *tacinae*, 3659, 4081, 4277. Endromis, 4179. Saturn 3227, 3244, 3485, 3861. Aglia, 4179. Attacus, 38 4051, 4084; [Platysamia], 4172; [Callosamia], 35 4174; [Tropaea], 4232; [Telea], 3674. *Bomby* Bombyx, 3441, 3765, 4128. *Philosamia*, Harp

Notodonta, 3149, 3304, 4031. *Psychiinae*.
s [Oeketicus], 3926, 3993. Thyridopteryx,
99. Phryganidia, 3244. *Cochlidiinae*.
es, 3997. Eulimacodes, 3244, 3495. Mono-
997. Euclea, 3260. *Dasychirinae*, 3734.
1, 3918, 3920. Ocneria, 4179. Orgyia, 3217,
92, 3616, 3620, 3646, 3921. Liparis, 3461,
76, 3765. *Arctiinae*, 3215, 3244, 3638.
s, 3983. Halisidota, 3264, 3987, 3992.
ia, 4061. Antarctia, 3287. Nemeophila,
rctia, 3261, 3863, 3922, 4165, 4179. Calli-
4061. *Lithosiinae*. Delopeia, 4228. Nola,
7.—Charagia, 4171.

8. SPHINGINA.

8,1. **Glaucopididae**. Eunomia, 4149.

8,2. **Zygaenidae**, 3256, 3283, 4045.
nae, 3244. Anatolmis, 3249. Pygoctenucha,
enthetria, 3256. *Castniinae*, 3264. Alypia,
lypioides, 3983.

8,4. **Thyridae**. Dysodia, 3694.

8,5. **Aegeridae**, 3251, 3283, 3830, 4200.
3148, 3262, 3922. Trochilium, 3155. Melit-

8,6. **Sphingidae**, 3243, 3283, 3437, 3587,
15, 3957, 4193. *Sphingini*. Hyloicus, 3229.
3229, 3249, 3308, 3329, 3486, 3578, 3627, 3699,
57, 3965, 4031, 4086, 4291. Macrosila, 3718.
hini. Smerinthus, 3143, 3151, 4081, 4119,
9. Acherontia, 3597, 3664. *Choerocampini*.
, 3957. Choerocampa, 3830, 4291. Phil-
, 3150, 3596. *Macroglossini*. Thyreus, 4085,
lemaris, 3957.

595,789. RHOPALOCERA.

83-3284, 3379, 3775, 3827, 3844-3845, 3914,
86, 4274.

9,1. **Hesperiidae**, 3214, 3851, 3854-3855,
Nisoniades, 3271-3272. Syrichtus, 3844.
1, 3838, 3840, 3842-3844, 3847-3848, 3853,
amphila, 3253, 3688, 3848. Erycides, 3433.
s, 3120, 3272, 3338, 3433, 3688, 4221, 4259.

9,2. **Papilionidae**. *Papilioninae*, 3734,
apilio, 3129, 3135, 3141, 3226, 3338, 3382,
17, 3668, 3740, 3772, 3789, 3844-3845, 3854,
61, 3923, 4058, 4083, 4116, 4142, 4160, 4165,
79. Parnassius, 3841, 3849, 3853. *Pierinae*,
anthoc[h]aris, 3214, 3218, 3841, 3852, 3854-
Colias, 3432, 3840-3841, 3844, 3853, 4228.
ryx, 3680, 4072. Rhodocera, 3140, 4253.
as, 4139. Pieris, 3126, 3257, 3322, 3338,
17, 3842, 3851-3853, 3865, 4013, 4050, 4117,
33. Terias, 3157. Aporia, 3734, 4179.

9,3. **Lycaenidae**, 3218, 3848-3849, 3851-
26, 4070, 4119. *Theclinae*. Thecla, 3254,
40, 3858. *Lycaeninae*. Feniseca, 4197. Chry-
s, 3853-3855, 3942, 4048. Lycaena, 3371.
15, 3946, 3983, 4191.

9,4. **Lemoniidae**. *Lemoniinae* [Ery-
, 3624. Lemonias, 3851, 4081. Charis,

9,6. **Nymphalidae**. 3757, 4200. *Nym-
e. Apaturini*. Amathusia, 4119. Agrias,
Apatura, 3104, 3856, 4063, 4165, 4239.
Limenitini. Limenitis, 3124, 3838, 3380, 3574, 3839,
3845, 3849, 3946, 4035, 4078, 4165, 4199. *Vanessini*,
4063. Timetes, 3847, 3850. Junonia, 4116, 4259.
Vanessa, 3154, 3338, 3390, 3503, 3734, 3773, 3829,
3872, 4007, 4078, 4107, 4149, 4165, 4179, 4228.
Pyrameis, 3296, 3338. Grapta, 3338, 3849, 3852-3853,
3859-3860, 4240. *Argynnini*, 3842, 3851. Phyciodes,
3854-3855, 3944. Melitaea, 3214, 3218, 3338, 3386,
3734, 3841, 3843, 3850, 3852, 3858, 3943, 4052, 4165,
4179. Brenthis, 3274, 3277. Argynnis, 3258, 3274,
3734, 3845, 3848-3853, 3855, 4058, 4119, 4165, 4179,
4259. Euptoieta, 3382, 4259. *Heliconinae*, 3624,
4057. Heliconia, 3252. *Morphinae*. Morpho, 4265.
Satyrinae, 3734. Coenonympha, 3218, 3852, 3854,
3945. Epinephele, 4015. Satyrus, 3837, 3843, 3851.
Chionobas, 3338, 3841, 3848, 3851. Oeneis, 4110.
Erebia, 3855, 3857, 4063. Euptychia, 3854.—Ragadia,
4123. *Danainae*, 3574, 3772, 4057, 4235. Danais,
3130, 3296, 3449, 3580, 4061, 4119, 4149, 4194.

595,79. HYMENOPTERA.

3358, 3372, 3434, 3583, 3819, 3895, 4089, 4101, 4142.
Terebrantia, 3790. Phytophaga, 3901. Entomophaga,
3790. Mellifera, 3502.

595,791,1. **Tenthredinidae**, 3155, 3439, 3457,
3460, 3639, 3900, 4177. *Cimbicinae*. Zaraea, 4246.
Hylotominae. Hylotoma, 3155. *Tenthredininae*,
3457. Euura, 3350. Nematus, 3350-3351, 3460, 4031,
4199, 4218. Dolerus, 3313. Hemichroa, 3460. Erio-
campa, 3460. Phyllotoma, 3460, 4177. Selandria,
3746, 3865. Tenthredo, 3901.

595,791,8. **Uroceridae**. Urocerus, 3791. Sirex,
3872, 3901.

595,792,2. **Cynipidae**, 3349, 3356-3357, 3397,
3416, 3439, 3454, 3501, 3622, 3890, 3900, 4028, 4218.
Psenides, 3351. *Cynipinae*. Rhodites, 3422, 3429,
3448-3449. Diastrophus, 3355, 3427. Antistrophus,
3351, 3427. Cynips, 3106-3107, 3341. 3349, 3351,
3355, 3357, 3403, 3416, 3425-3427, 3454, 3501, 3575,
3901, 4182. Spathegaster, 3107. Biorhiza, 3891.
Neuroterus, 4193. *Figitinae*. Figites, 4218.

595,792,8. **Evanidae**, 3801, 3810, 4041. Aula-
cus, 3798.

595,792,9. **Trigonalidae**, 3809.

595,793,1. **Ichneumonidae**, 3262, 3338, 3379,
3384, 3439, 3484, 3792, 3800, 3802, 3805, 3810. Ich-
neumoninae, 3790. Ichneumon, 3801. Phaeogenes,
3262. Ischnus, 3801. Acrodactyla, 3286. Cryptus,
3583. Ort[h]opelma, 4218. Hemiteles, 3450. Oph-
ion, 3674. Campoplex, 4218. Limneria, 4218.
Pimplinae, 3799. Arotes, 3806. Rhyssa, 4082.
Ephialtes, 3450. Pimpla, 3450, 4218. Polysphincta,
3364.

595,794. **Braconidae**, 3338, 3344-3345. Aniso-
pelma, 3320. Aleiodes, 3813. Davisania, 3469.
Apanteles, 4167. Microplitis, 3345. Microgaster,
3450.

595,795. **Chalcididae**, 3114-3115, 3338, 3770,
3810-3811, 3822, 4028, 4149, 4218. Agaoninae, 4028.
Smicra, 3108. Eurytoma, 3427, 3450. Callimome,
3398. Antigaster, 3598. Coccophagus, 3105.
Aphelinus, 3109, 3598. Pirene, 3450. Spalangia,
3116. Pteromalinae, 4168. Pteromalus, 3116, 3384.
Trichogramma, 4199.

595,796,1. **Proctotrupidae**, 3810, 3886. Ceraphron, 4168. Teleas, 4134. Telenomus, 3886. Scelio [Caloptenobia], 3291. Platygaster, 4201.
595,796,9. **Chrysididae**, 3811.
595,797,1. **Formicidae**, 3435 (3438), 3436, 3810-3811, 3934, 3958, 4029, 4058, 4078, 4185. Camponotus, 3240. Polyrachis, 3958. Formica, 3872, 4193, 4259. Lasius, 4070, 4187, 4219.
595,797,2. **Poneridae**. Ponera, 4185.
595,797,3. **Attidae**. Atta, 3477, 3894. Pheidole, 4219.
595,797,4. **Myrmicidae**. Pogonomyrmex, 3102, 3436.
595,797,5. **Mutillidae**. Mutilla, 3804.
595,797,6. **Scoliidae**, 3791. Tiphia, 4207, 4262.
595,797,7. **Pompilidae**, 3818. Pompilus, 3338, 3439.
595,797,8. **Sphegidae**, 3439. Coloptera, 3791. Pelopoeus, 3536, 4149, 4193.
595,797,93. **Larridae**, 4011-4012. Larra, 3291.
595,797,98. **Bembecidae**. Stizus, 3964, 4259.
595,798,1. **Nyssonidae**. Gorytes, 3791.
595,798,4. **Trypoxylonidae**. Trypoxylon, 3469, 3536, 4011.
595,798,7. **Masaridae**. Masaris, 3794-3795, 3807-3808.
595,798,8. **Eumenidae**, 3791. Eumenes, 3583. Odynerus, 3819.
595,798,9. **Vespidae**, 3792. Polistes, 3583, 3791. Vespa, 3237, 3583, 3610, 3872.
595,799,3. **Andrenidae**, 4118. Colletes, 4154. Halictus, 3522, 3563. Augochlora, 3563. Nomia, 3791. Andrena, 3502, 3680, 3791. Macropis, 3444, 4149.
595,799,8. **Apidae**, 3563, 3791-3793, 3796-3797, 3803, 3815, 3821, 4118, 4195. Nomada, 3816. Coelioxys, 502. Osmia, 3817. Megachile, 3819. Anthophora, 3680, 3814. Apathus, 3812. Bombus, 3337, 3439, 3467, 3502, 3558, 3667, 3766, 3812, 3872, 4110, 4119, 4133, 4173, 4259. Melipona, 4219, 4287, Apis, 3285, 3337, 3439-3440, 3476, 3684, 3722, 3789, 3898, 4065, 4146, 4149, 4179, 4260.

597. ICHTHYOPSIDA.

597,8. Anura. Hyla, 4166.
597,9. Urodela. Amblystoma, 3587.

598. SAUROPSIDA.

598,1. REPTILIA.

598,12. Ophidia. Heterodon, 4259.

598,2. AVES,

3395, 3966, 4149.
Laridae. Hydrochelidon, 3159.
Tetraonidae. Ortyx, 3571. Phasianus, 4138.
Falconidae. Buteo, 3832.
Strigidae, 3832. Strix, 3778.
Alcedinidae. Halcyon, 4099.
Tyrannidae. Contopus, 4058.
Fringillidae. Passer, 4137.
Saxicolidae. Sialia, 3961-3962.
Turdidae, 3960.
598,206. **Societies of ornithology.**
Undertakings. American ornithologists' union, 4137.

599. MAMMALIA,

3778, 4075.
Sciuridae. Tamias, 4086, 4259. Sciurus, 4004.
Rhinocerotidae. Rhinoceros, 4121.
Equidae. Epuus, 3998.
Suidae. Sus, 3823.
Cavicornia. Bos, 3998. Ovis, 3312.

[END OF SPECIAL ZOOLOGY.]

6. USEFUL ARTS.

605. Periodicals. Scientific american, 4238.
606. Societies.
Exhibitions. World's industrial and cotton centennial exposition, 4136.
608. Patents, 4237.

61. MEDICINE.

615. Materia medica and therapeutics [*see also* **59163**]. Omnipathy, 3976. Scurvy, 3633, 4280.
616. Human pathology. *Parasites.* Diptera, 3361, 4120. *Poisoning.* Carbon disulphide, 4088.
619. Veterinary medicine. *Parasites.* 3568-3569.

63. AGRICULTURE.

630,5. Periodicals. American agriculturist, 4060.
630,6. Societies. Connecticut board of agriculture, 3715-3718. New Jersey state horticultural society, 4198.
632. Agricultural pests a: d hindrances, 3291 *c*.
Means against injurious animals. Animals injurious to fowl, 3715. Apple borer, 4010. Parasites of domestic animals, 3568-3569, 3749. Tobacco insects, 3718.
Hexapoda, 3507=3360, 3705, 3716, 3718, 3751, 3865-3866, 3927, 3976, 3994, 3996, 4071, 4073, 4271, 4281. Acridiidae, 3291 *o*. Pachytylus, 3291 *u*. Caloptenus, 3291 *c*. Dermatodectes, 3717. Coccidae, 3670, 3705. Chrysomphalus, 3600. Phylloxera, 4071, 4073, 4251. Chermes, 3755-3756. Schizoneura, 3547. Aphidi-

dae, 3113. Blissus, 3402, 3571. Phytonomus, 3309. Lyttinae, 3578. Bruchus, 3969. Doryphora, 3359, 3466, 3578, 3641-3642. Crioceris, 3548. Prionus, 3572. Chalepus, 3331. Agrilus, 3447. Drosophila, 3711, 3714. Trypeta, 3700. Cecidomyia, 3605, 3666, 3689, 3929. Eudemis, 3573. Crambus, 3334. Chilo, 3332. Pempelia, 3346. Noctuidae, 4198. Heliothis, 3549, 3882. Notodonta, 3149. Orgyia, 3646. Sphinx, 3308. Pieris, 4013. Selandria, 3746. Isosoma, 3770.

Administrative measures [*see also* **35**].

Insecticide animals [*see also* **59164**]. Parasites, 4199. Formicidae, 4058.

Insecticide apparatus, 3614. Nether insertion apparatus, 4071, 4073.

Insecticide plants [*see also* **58164**]. Lycopersicum, 4281.

Insecticide substances [*see also* Poisons], 3705, 3716, 3751. Carbolic acid, 3670. Kerosene, 3670. Naphthalin, 4073. Petroleum emulsion, 4071.

Insectipells. Tar, 4271.

Poisons. London purple, 3360 = 3507. Paris green, 3994, 3996.

633. Field crops. Cotton, 3835.

634. Orchards and vineyards. Ficus, 4131.

634,9. Forestry. Catalpa, 3308.

635. Kitchen gardens. Asparagus, 3548.

636. Domestic animals. Poultry, 3715.

638. Insecticulture.

APICULTURE, 3544.

Honey, 3875, 4065, 4095, 4183. *Preservation*, 3722, 3739, 4256. *Production*, 4065. *Sources*, 4183. Artificial, 3875. Ergot, 4095. Aphididae, 4095. *Statistics*, 4294.

Manuals of apiculture, 3530.

SERICULTURE, 4131. Attacus, 3592. Telea, 3674. *Variety of silk-insects*, 3592, 3674.

64. DOMESTIC ECONOMY.

MEANS AGAINST HOUSE INSECTS. Termes, 3544.

641. Cookery. Acridiidae, 4181. Diptera, 3781.

65. COMMERCE.

659. Advertising, 4059.

66. CHEMICAL TECHNOLOGY.

661. Production of chemicals. Insect powder, 4271.

667. Bleaching, dyeing, &c. Cochineal, 4086. Galls of cynips, 3341.

67. MANUFACTURES.

671. Metal manufacture. Casts of insects, 3493.

7. FINE ARTS.

75. PAINTING.

Illustrations of insects, 4080-4081.

76. ENGRAVING.

Insects, 4086. Lepidoptera, 4087.

9. HISTORY.

91. GEOGRAPHY AND TRAVELS.

915,5. Persia, 4183.
916. Africa, 3544.
917. North America, 3570.

92. BIOGRAPHY.

924. Philologians. 4136.

925. Scientists. Entomologists, 3132, 3145, 3651-3658, 3862, 4112, 4143, 4214, 4241-4242.

Aaron, 4136. Allen, 4139. André, 4138. Angas, 4122. Arkwright, 4149. Arribalzaga, 4297. Ayres, 4134.

Babbington, 4147. Bailey, 4134. Balbiani, 4128. Balfour, 3187. Barnes, 4085. Beale, 4084-4085. Bedel, 4132. Belfrage, 3188, 4085. Berce, 3162. Blackburn, 3171. Blackwall, 3172. Blake, 3774. Blomefield, 4147. Boisduval, 3163. Boll, 3368. Bowditch, 4086-4087. Buckler, 4137-4138. Burgess, 4084.

Carrington, C., 3857. Chadbourne, 4083. Chambers, 4085, 4232. Champion, 4122. DE Chaudoir, 3173. Clarke, 4078. Clemens, 3916. Colvin, 4197. Cooke, B:, 4131. Coquillett, 3221, 4137. Cornalia, 3189. Cowan, 4299.

Dammer, 4130. Darwin, C: R., 3190, 3762. De Grey, 3327, 3332, 4091, 4147. Devereaux, 4084-4085. Dimmock, G:, 4078, 4084-4085. Dollfus, 4106-4107. Dunning, 4147. Dzierzon, 4189.

Eaton, C. C., 4078, 4084. Edwards, H:, 4136, 4202. Edwards, W: H:, 3914. Elliot, 4202.

Fernald, 3954, 4130. Fish, 4130. Fitch, E. A., 4147. Fletcher, 4132. Foerste, 4078. Forbes, S. A., 4078. Forbes, W: A., 4133, 4300.

Garneys, 3174. Géhin, 3363. Giebel, 3175. Glover, 4085, 4124, 4134. Goossens, 4136. Graef, 4197. Gray, J:, 3176. Grote, 3327, 3332, 3606, 4159. Grut, 4147. Guenée, 3164, 3916. Gurlt, 3191.

Hagen, 3412, 3424, 4104, 4136. Haldeman, 3132, 3165. Harrington, 4078, 4132. Harris, 4084, 4086-4087. Harvey, T. S., 4085. Hayes, 4131. Haydon, 3775. Hayward, 4078, 4080, 4082-4083, 4086-4087. Hazlewood, 4086. Heer, 4083. Hensel, 3177. Henshaw, 4078-4079. Hey, 3192. Horn, 4263. Howard, L. O., 4130, 4199. Hubbard, 4199.

Jack, 4084-4085, 4087. Jenkins, 4132. Jobson, 3193. Jousset de Bellesme, 3968, 4131.

Kiesenwetter, 3166. Kirby, 4147. Kirschbaum, 3167. Koch, 3178. Krauss, 4180, 4216. Künckel d' Herculais, 3968.

Laboulbène, 3734. Labrey, 3194. Lacoe, 4085 Leconte, J: E., 4080-4081. Leconte, J: L., 3870,

4085-4086, 4142, 4186, 4263. Leuckart, 4109. Leuthner, 4122. Lichtenstein, 3323. Lintner, 4078. Logan, 3857. Lubbock, 3762. Lütken, 4131.

McLachlan, 3482. Macloskie, 4078. Maeklin, 4211. Malm, 3195, 4130. Mann, 4078, 4084-4085, 4130. Mark, 4078, 4086, 4134. Matthews, 4078, 4083. Mégnin, 4147. Melsheimer, F. E., 4086. Meske, 4197. Metschnikoff, 4130. Mniszech, 3179. Morris, J: G., 3603. Morrison, 3214, 3938, 4225. Moss, 3196. Müller, F., 4149. Müller, H., 4085, 4111, 4115, 4236. Mulsant, 3168. Mylius, 4256.

Nikolai, 4138. Norman, 3197.

Ougspurger, 3169.

Packard, 3291*q*, *v*, 3667, 4149. Patton, W:, 4134. Peck, 4197. Pergande, 4087. Peters, 4132. Pritchard, 3198. Putnam, 3180, 3250, 4104. Putzeys, 3199.

Reinhardt, 3200, 4131. Riley, C: V., 3415, 4138. 4140, 4186, 4199. Rolleston, 3181. Romanis, 4191. Rosenhauer, 3182. Rothenbach, 3183. DE Rougemont, 3184. Russell, 3929.

Salensky, 4130. Salvatico, 4128. Sanborn, 4086-4087, 4132, 4137, 4139, 4224. Sanders, J. E., 4104. Saunders, E., 4147. Saunders, S. S., 4147, 4266. Savage, 4078, 4086. Schmidt, F., 3201. Schmidt-Goebel, 3202. Scudder, 4078, 4081, 4083-4087. Semper, 4123. Shimer, 3571. VON Siebold, 4142. Siewers, 3203. Sinclair, 3204. Smith, J: B., 4255. Smith, S. I., 3716, 3718. Snellen van Vollenhoven, 3170. Snow, 3983, 3987, 4078. Spence, 4147. Spiller, 4147. Storer, 4195. Stuxberg, 4130. Sumichrast, 3790. Stykes, 4086-4087.

Tarriel, 3205. Thomas, C., 3402. Thompson, 3206. Thwaites, 4207. DE Tinseau, 3208. Treat, 4198. Troschel, 3209. Tyrrell, 4132.

Wales, 3210. Wales, 4254. Waterhouse, 4147. Webster, C: E., 4086. Weismann, 3762. 4142. Welwitsch, 4149. Westring, 3211. Westwood, 4147. 4163. Weyenbergh, 4087. Whitman, 3185. Whymper, 4123. Wittfeld, 3252, 4078.

Yersin, 3291, *w*.

Zaddach, 3186. Zeller, 4133. Zimmerman, 4078. Zimmermann, 4086.

Lists of scientists, 3145, 3651-3658, 3862.

Notices of private collections of insects. Chevrolat, 4092. Leconte, J: L., 4263. Lewis, 4123. Morrison, 4289. Packard, 4289. Riley, C: V., 3160. Snow, 3264. Trabrandt, 3318. Whymper, 4123. Wittfeld, 4078.

926. Economists.

State entomologists. Connecticut, 3716, 3718.

[7248 references to 3607 topics.]

PAGING OF THE BIBLIOGRAPHICAL RECORD OF PSYCHE, VOL. 4.

Record Nos.	Page Nos.	Record Nos.	Page Nos.	Record Nos.	Page Nos.	Record Nos.	Page Nos.
3101-3111	15	3379-3394	137	3662-3674	232	3940-3952	319
3112-3126	16	3395-3405	138	3675-3683	255	3953-3966	320
3127-3144	17	3406-3416	149	3684-3694	256	3967-3981	321
3145-3161	18	3417-3433	150	3695-3704	257	3982-3998	322
3162-3171	33	3434-3440	161	3705-3714	258	3999-4015	323
3172-3186	34	3441-3454	162	3715-3725	259	4016-4028	324
3187-3190	35	3455-3463	171	3726-3734	260	4029-4041	325
3191-3203	36	3464-3476	172	3735-3747	261	4042-4057	326
3204-3218	37	3477-3489	173	3748-3761	262	4058-4072	339
3219-3234	38	3490-3504	174	3762-3774	263	4073-4090	340
3235-3243	55	3505-3513	187	3775-3787	264	4091-4106	341
3244-3255	56	3514-3528	188	3788-3794	289	4107-4122	342
3256-3270	57	3529-3538	189	3795-3806	290	4123-4148	343
3271-3282	58	3539-3550	190	3807-3818	291	4149-4164	344
3283-3291	77	3551-3560	207	3819-3831	292	4165-4179	345
3292-3302	95	3561-3570	208	3832-3845	293	4180-4197	346
3303-3310	96	3571-3580	209	3846-3858	294	4198-4214	347
3311-3327	97	3581-3590	210	3859-3871	295	4215-4231	348
3328-3337	98	3591-3600	227	3872-3884	296	4232-4251	349
3338-3345	117	3601-3618	228	3885-3896	315	4252-4268	350
3346-3353	118	3619-3630	229	3897-3909	316	4269-4284	350*
3354-3362	135	3631-3647	230	3910-3926	317	4285-4300	350**
3363-3378	136	3648-3661	231	3927-3939	318		

[Bind this page (377) so that it can be unfolded to be read when the volume is closed.]

146. funebris, 230. -puritana, **8**. repanda, **219**, 325. sexguttata, 207, 232. tortuosa, **219**. vulgaris, **8**.
Cicones, 171.
Cilix spinula, **314**.
Cimex, 230.
Cindaphia bicoloralis, 229.
Cionus scrophulariae, **116**.
Circotettix maculatus, 78.
Ciris, 57.
Citheronia regalis, **100**, 209, 231.
Cladenia, 174.
Clapra, 174.
Cleophana linariae. 260.
Clisiocampa, 58. americana, 58, **275**. 295. californica, 56, 58. constricta, 58. disstria, 58, **275**. erosa, 58. fragilis, 58. silvatica, **275**. strigosa, 58. thoracica, 58.
Clistopyga annulipes, 290.
Clotho, 208.
Clubiona agaricus, 208. claustraria, 66. filices, 208.
Clytus, **283**. robiniae, **44**, **63**, 342.
Cnethocampa, 171, 263.
Coccinella californica, 257. munda, 209. novemnotata, **338**. quinquenotata, 257.
Coccophagus flavoscutellum, 15.
Coccus, **19**.
Cochylis [scr. Conchylis, q. v.] hilarana, 162.
Coelioxoides, 290. punctipennis, 290.
Coelioxys, **88**, 174, 290, 291. producta, 292. tegularis, 292.
Coelodasys unicornis, **279**.
Coenonympha ampelos, 294. brenda, 294. californica, 37. gemma, 319. kodiak, 294. pulla, 37.
Coenopeta fucosa, 229.
Colaspis brunnea, **123-130**, 344.
Coleophora, **243**, 256.
Colias, 150. alexandra, 293, 354. ariadne, 294. behrii, 293. christina, 293. edusa, **84**. emilia, 294. edwardsii. 294. helena, 293. meadii, 294.
Colletes, **88**, **298**.
Coloptera wrightii, 289.
Compsomyia macellaria, **29**, **112-114**, **350**.**
Conchylis (v. Cochylis), 318.
Conocephalus, 341. dissimilis, **235**.
Conops, 38.
Conorhinus sanguisuga, 209.
Conotrachelus nenuphar, 162.
Contopus virens [aves], **32**.
Copaeodes eunus, 37.
Copidryas, 57. gloveri. 56.
Copimamestra occidenta, 322.
Corsebus bifasciatus, 261.
Coriscium, **74**, 317.
Corixa, **225**, **338**.
Cornicularia, 259.
Corydalus, **103**, 187, 189. cornutus, 135, **151**, **179-184**, 187-190, **191**, 232, 346.
Corymbites hamatus, **203**. vernalis, **203**.
Corynetes violaceus, **234**.
Coscinoptera dominicana, 228.
Cossus, **105**, **106**. **274**. centerensis, **106**, 315. robiniae, **105**, **106** (v. Xystus r.). querciperda, **105**.
Cotalpa lanigera, 325.
Coxelus, 171.
Crambodes talidiformis, 259.
Crambus dissectus, 321. inornatellus, 257. exesus, 321. oregonicus, 321. vulgivagellus, 97, 98. warringtonellus, 98.
Cratypedes putnami, 78.
Crioceris asparagi, 190.
Crocisa lata, 290.
Croesia persicana, 38.
Croesus latitarsus, **286**.
Cryptohypnus squamifer, **25**.
Cryptolechia confertella, **241**.
Cryptus, 290. grallator, 290. junceus, 210.
Cteniscus, 290.
Cteniza, **176**, 350.** californica, **176**.
Ctenucha rubroscapus, 56. walsinghamii, 56.
Ctenus tangeneus, 208.
Cucullia, 228, 260.
Culex, **4**, **69**, **70**, **147**, 173, 190, **225**, 230, 324.
Cupes capita, 17.
Curculio, 90.
Curtoneura [scr. Cyrtoneura, q. v.] stabulans, **119**.
Cuterebra, **309-310**. emasculator, **226**, **338**.
Cybister roeseli, **314**.
Cycloceph ala, 98.
Cycloneda abdominalis, 257. oculata, 257. sanguinea, 257.
Cyclopides skada, 294.
Cycloplasis, 257.
Cyclops, **79**.
Cylloceria occidentalis, 290.
Cymatophora crepuscularia, **271**, **272**. pampinaria, 57.
Cynips, **89**, 135, 138, 149, 150, 162, 316. baccarum, **90**. crustalis, **90**. curvator, **91**. folii, **89**. foveiger, **91**. gallaetinctoriae, 117. gemmae, **90**. glechomae. **91**. inflator, **91**. longiventris, **89**. manniparax, **191**. q.-agrifoliae, 135. q.-aquaticae, 15. q.-batatoides, 15. q.-batatus, 135. q.-californica, 135, 149, 174. q.-catesbaei, 15. q.-cinerea, 15. q.-confusa, 15. q.-decidua, 135, 150. q.-ficus, 15. q.-foliata, 15. q.-formosa, 135. q.-frondosa, 118, 135, 209. q.-hirta, 135. q.-ilicifoliae, 135. q.-inanis, 118, 150. q.-lanigera, 15. q.-majalis, 135. q.-nubila, 135. q.-nubilipennis, 135. q.-operator, 118. q.-prunus, 118. q.-rugosa, 15. q.-scitula, 135. q.-seminator, 118. q.-similis, 135. q.-singularis, 135. q.-spongifica, 118, 150. q.-strobilana, 135. q.-succinipes, 15. q.-suttonii, 135. q.-tuber, 135. q.-turnerii, 15. q.-ventricosa, 135. q.-virens, 15. ramuli, **91**. rosae, **91**. salicis-strobiloides, **242**. terminalis, **90**, 150.
Cyrtarachne, 319. cornigera, 260.
Cyrtogaster, 319.
Cyrtognatha, 260.
Cyrtoneura (v. Curtoneura) stabulans, 188.
Cyrtophorus gibbulus, **204**. verrucosus, **204**.
Dactylosphaera (v. Phylloxera), 207, 263. caryaesemen, 207. globosa [-um], 207, 263. vitifoliae, 207, 263.
Dactylopius, 258.
Daedalina. 174.
Dahana atripennis, 56.
Dakruma, 57. coccidivora, 257, 258. grossulariae, 321. turbatella, 321.
Dalmannia, 264. picta, 264.
Danais, **76**, **104**, 346. archippus, 17, **59**, **69**, 95, 162, 209, **312**.
Darapsa, 320. versicolor, 55.
Dasycera, 257.
Dasydera ursina, 325.
Dasyleptus lucasi, 340, 353.
Dasypoda, **88**.
Datana, **279**. ministra, **279**.
Davisania, 172. aughei, 172.
Decatoma, **91**, 263. batatoides, 16. biguttata, **90**. flava, 16. foliatae, 16. incrassata, **91**. lanae, 16. phellos, 16. quercii, 16. submutica, **91**.
Dectes spinosus, **204**.
Degeeria lanuginosa, 228.
Deidamia inscripta, 55.
Deilephila lineata, 55.
Deilinia glomeraria, 38. septemfluaria, 38.
Deiopeia pulchella, **83**.
Demodex, 292. phylloides, 292.
Dendroides canadensis, **283**. concolor, **283**.
Depressaria, 256.
Dermatobia, **305**, **306**, **308-310**. noxialis, **175**, 208.

Dermatodectes ovis, 259.
Dermestes lardarius, 9. vulpinus, 234, 350.**
Derotettix mendosensis, 55.
Desmocerus palliatus, 221, 350.*
Deuterocopus, 313.
Deva palliger, 38. purpurigera, 38.
Diabrotica fossata, 263. longicornis, 261, 268.
Diaperis hydni, 284.
Diapontia kochii, 139.
Diastema, 174.
Diastrophus, 150. nebulosus, 150. potentillae, 135.
Dicaelus dilatatus, 335.
Dicerca obscura, 221. pugionata, 203.
Dichelonycha elongatula, 285.
Dichroa, 88.
Dicopis depilis, 38. vitis, 295.
Dictyna sedentaria, 260. volucripes, 260. volupis, 260.
Dictyoneura goldenbergi, 225.
Dilar americanus, 173.
Diloplus, 173.
Diphryx, 97, 98. prolatella, 97, 98.
Diplax, 321.
Diplosis caeomatis, 334. coniophaga, 334. grassator, 260, 262. resinicola, 138.
Diplostyla, 259.
Dircenna, 191.
Dirphia caisa, 229.
Discolia lecontei, 289. flavostalis, 289.
Disparipes bombi, 206.
Disteria undata, 204.
Ditomus, 171.
Ditula, 257.
Dolerus unicolor, 97.
Dolichopus, 173.
Dolomedes sexpunctatus, 235.
Donacia, 175.
Doritis apollo, 260. mnemosyne, 260.
Dormadicus, 206.
Dorthesia celastri, 149. viburni, 149.
Doryphora decemlineata, 134, 135, 172, 189, 209, 229, 230, 258, 295, 318. juncta, 172, 209.
Drassus perfida, 208.
Drepana, 278.
Drosophila amoena, 258. ampelophila, 258. nigricornis, 211.
Dryocampa senatoria, 318 (v. Anisota s.).
Dryopteris, 278.
Dularius brevilineus, 203.
Dysodia margaritana, 256.
Dysphaga tenuipes, 204.
Dytiscus, 318. marginalis, 173.
Ebaeus thoracicus, 260.
Ecpsis, 57. footiana, 320. permundana, 242. zelleriana, 242.
Edessa fuscidorsata, 162.
Elphosoma, 291.
Elachista, 257.
Elaphidion unicolor, 204.
Elassoneuria, 171.
Elater, 75. nigricollis, 285. protervus, 284.
Elis xantiana, 289. zonaria, 289.
Elmis aeneus, 229. volkmari, 229.
Eleodes, 168-169, 350.** acuta, 168. dentipes, 321. extricata, 168. gigantea, 321. hispilabris, 168. longicollis, 168. obsoleta, 168. suturalis, 168. tricostata. 168-169.
Ellopia vitraria, 322.
Elodes coarctatus, 229. serricornis, 229.
Empis, 173.
Emplocia cephisaria, 57. fervefactaria, 57.
Empoa, 190. albicans, 190.
Empoasca. 190. consobrina, 190. obtusa, 190. viridescens, 190.
Enchenopa binotata, 241.
Enchophyllum binotatum, 149.
Encyrtus, 117. montinus, 117. turni, 117.
Endophloeus, 171.
Endromis versicolora, 201.
Endropia armataria, 240, 272.
Endrosis fenestrella, 95.
Enicostoma, 256.
Entedon, 117. antiopae, 117.
Entimus, 67. imperialis, 5, 45-47, 342.
Epeira, 32, 66, 208, 319. baltimorensis, 260. cavatica, 260. diadema, 208. fasciata, 208. filices, 208. praetrepida, 260. prasinus, 208. punctillata, 260.
Epeiroides, 323.
Epeolus, 290, 291. bifasciatus, 290. mercatus, 290.
Ephemera, 110, 288.
Ephemerella ignita, 326.
Ephialtes, 162, 290.
Ephydra, 173. californica, 264.
Ephyra, 325. pendulinaria, 272.
Epicauta marginata, 209. pensylvanica, 209, 263. vittata, 78, 209.
Epigraphia eruditella, 321, 322.
Epimecis wiltii, 290.
Epinephele lycaon, 323.
Epirhyssa, 291.
Epitrix cucumeris, 209.
Erastria nubila, 229.
Erax, 244, 264.
Erebia callias, 294. haydenii, 294. medea, 352. rhodia, 294.
Eresia cincta, 293. punctata, 294.
Erigone, 259.
Eriocampa ovata, 171.
Erioscele, 174.
Eriosoma, 190. lanigera, 190 (v. Schizoneura l.). pyri, 190. tessellata, 240.
Eristalis, 173. tenax, 39, 324.
Erycides okeechobee, 150.
Erythroneura, 190. australis, 190. octonotata, 190. ziczac, 190.
Etoblattina mazona, 58.
Eubyja mexicanaria, 322.
Euceratomyia, 264.
Euchaetes collaris, 56.
Euchronia maia, 225 (v. Hemileuca m.). monitor, 57. paenulata, 57.
Euclemensia bassettella, 98.
Eucrada humeralis, 229.
Eudamus, 104. electra, 16. nevada, 58. oberon, 150. proteus, 58, 256. tityrus, 117, 338, 348, 352.
Eudemis botrana, 209.
Eudocimus mannerheimii, 221.
Eudoliche, 174.
Eudryas, 57.
Eugonia alniaria, 272. angularia, 323. magnaria, 272-273.
Euhagena, 56. nebraskae, 56.
Euleucophaeus neumoegeni, 56. sororius, 56. tricolor, 322.
Eulimacodes, 174. scapha, 56 (v. Limacodes s.).
Eulophopteryx, 174.
Eulophus, 117. saundersii, 117.
semideae, 117. theclae, 117.
Eumenes fraterna, 210.
Eunomia eagrus, 312.
Eupelmus azureus, 90. urozonus, 90.
Euphoria inda, 215.
Eupithecia interruptofasciata, 37.
Euplexia lucipara, 59.
Euprepia opulenta, 37.
Euptoieta claudia, 99, 137, 338.
Euptychia rubricata, 294.
Eurymachus, 260.
Euryopsis, 259.
Euryptychia, 257. saligneana, 77, 117, 138, 149, 150, 257.
Eurytoma, 91, 263. appendigaster, 89. bolteri, 162. diastrophi, 150. intermedia, 90. pubicornis, 91. salicis, 91. vagabunda, 16.
Euschirropterus, 57.
Euspilapteryx, 317.
Eustrotia concinnimacula, 322.

dividua, 322. parvimacula, 322.
Eutelus, **91**. collaris, **90**. heterotomus, **90**. tibialis, **91**.
Eutermes meadii, 190. fossarum, 190.
Euura orbitalis, 118. salicis-gemma, 118. salicis-ovum, 118.
Euxoga, 174.
Euxorides, 290. americanus, 290
Exapate, **73**.
Exartema, 57, 257.
Exochoides, 289.
Exochus, 289, 290.
Exomalopsis, 290. similis, 292.
Exorista militaris, 210.
Felis concolor [mamm.], 264.
Feniseca tarquinius, **75**, **99**, 346.
Ferreola, 291.
Figites anthomyiarum, **90**.
Filaria sanguinis-hominis [verm.], **225**.
Filistata capitata, 260. hibernalis, 260.
Flata, **314**.
Foenus, 290, 325.
Forficula auricularia, **186**.
Formica, **14**, 296. fusca, **32**. pennsylvanica, **336**. rufinigra, **254**. sanguinea, **32**.
Gabyna, 174.
Galeodes araneoides, **324**.
Galerita janus, 325.
Gasterophilus (v. Gastrophilus) equi, 208.
Gasteruption, 325. arca, 325. barnstoni, 325. brasiliense, 325. guildingii, 325. irritator, 325. incertum, 325. kirbyi, 325. montanus [-um], 325. occidentale, 325. perplexum, 325. ruficorne, 325. rufipectum, 325. tarsatorium, 325. tenuicolle, 325.
Gastropacha americana, **274**.
‡ raphani [Gastrophysa r.], 188.
Gastrophilus [scr. Gasterophilus, q. v.], **305-310**, 322, **351**.
Gastrophysa cyanea, 162. raphani, **176**. 188, 324.
Gastrus, 173.
Gelechia, **72-73**, 256. cerealella, **337**. flavocostella, 256. gallae-solidaginis, 162.
Geophilus, 263, 350.* carpophagus, 289. foveolatus, **235**. longicornis, 289. proavus, **248**.
Geotrupes, **216**. titvus, **145**.
Geralinura carbonaria, **226**.
Glaucopteryx caesiata, 56.
Glomeris, 259.
Glossina, 230.
Gloveria arizonensis, 56.
Glyphina ulmicola, 118.
Glyphipteryx, 256.
Glypta, 290.
Gnophaela, 56. continua, 57. hopfferi, 56. vermiculata, 56, 57.
Gomphocerus shastanus, 78.
Gonepteryx cleopatra, **204**. rhamni, **204**, 255.
Goniocotes hologarter, 174.
Gonioctena pallida, **283**.
Gonippa, 174.
Gonuris, 174.
Gordius, 78, **225**, **353**. emarginatus, **352**.
Gortyna immanis, **144**. juvenilis, 322. nebris, 77. nitela, 77, 209, 296. serrata, 322.
Gorytes propinquus, 289. tricolor, 289.
Gorytodes personaria, 56.
Gracilaria, **72**, 256, 257, 317. desmodifoliella, 257. 12-lineella, 317. eupatoriella, 317. plantaginisella, 317. violacella, 257.
Gracillaria [scr. Gracilaria, q. v.].
Gracilia minuta, **204**, **283**.
Grammonota, 259.
Grapholitha duodecimstriata, 318. puncticostana, **90**.
Graphops curtipennis, **167**. marcassita, **167**. pubescens, **167**. (v. Scelodonta p.).
Grapta, **104**, 294. angelica, 295. c-album, 295. c-aureum, 295. comma, 295. dryas, 294, 295. fabricii, 295. faunus, **99**, 294, 295. interrogationis, 117, **184**, 295, 349. marsyas, 294. oreas, 294. satyrus, 294. silenus, 294. umbrosa, 295. zephyrus, 294.
Grotea, 290. anguina, 290.
Gryllotalpa, 289, 296, **298**.
Gryllus, 263, 318.
Gypona, 58.
Gyrinus natator, 137.
Gyros, 56. opiparus, 56. versutus, 56.
Gyrostigma, **352**. sumatrensis, **352**.
Habrocytus, **91**. bedeguaris, **91**. capreae, **91**.
Habrophlebia, 171.
Habrostola, 260.
Hadena arctica, 38. cinefacta, 57. cymosa, 38. discors, 322. hulstii, 322. inordinata, 38. semiluuata, 38.
Halcyon chloris [aves], **351**.
Halesidota ingens, 37. labecula, 57. trigona, 322.
Halictus, 208. cylindricus, 188.
Haltica striolata, 207, 210.
Hamadryas, 257.
Hamamelistes cornu, 263.
Harpalus caliginosus, 323.
Harpyia vinula, 260.
Hectopsylla testudo, 264.
Heliconia charitonia, 56.
Heliodines, **72**.
Heliothis armigera, **96**, 137, 190, 229, 296. illinoiensis, 295. luteitinctus, 37.
Helopeltis, 16.
Helota, **313**.
Hemaris cynoglossum, 55. tenuis, 320. thysbe, 320.
Hemerodromia superstitiosa, 190.
Hemichroa rufa, 171.
Hemideina, **267**.
Hemileuca, **313**, 322. dido, 58. juno, 58. maia, 322 (v. Euchronia m.). nevadensis, 56. tricolor, 322. yavapai, 58.
Hemiteles, 137. cressonii, 162.
Hepialus, 37, **106**. anceps, 37. hecta, 255. inutilis, 37. rectus, 37.
Heriades, 290, 291. denticulatum, 290.
Hesperia, 293. dacotah, **294**. eos, 294. eufala, 294. hayhurstii, 294. horus, 294. logan, **319**. maculata, 293. melane, **294**. metacomet, 319. mingo, **293**. minima, 294. napa, 293. nemoris, 293, 319. nortonii, **319**. omaha, 293. ophis, 294. osyka, 319. ottoe, 293. pilatka, **319**. ricara, 293. rurea, 319. samoset, 319. tamenund, 294. vialis, 294. viator, 293. waco, 293. wakulla, 294. yreka, 293.
Heterodera [verm.[, **333**.
Heterodon platyrhinus [rept.], **335**.
Heteropterus arene, 294. procris, 294.
Hetoemis cinerea, **204**.
Hipparchia ridingsii, **354** (v. Satyrus r.).
Hippodamia ambigua, 257. convergens, 257. maculata, 209.
Hippopsis lemniscata, 118, **204**.
Hirmoneura obscura, 211, 316.
Hodotermes coloradensis, 190.
Holcocera, 256.
Homalomyia canicularis, **300**.
Homoeoneuria, 171. salviniae, 171.
Homohadena epipaschia, 322.
Homopsyche, **314**.
Homosetia, 256.
Hoplia, **9**, **23**, **46**, **67**, **70**. coerulea, **9-11**, **23**, 342. modesta, **23**. trifasciata, **66**.
Hoplismenus, 289. thoracicus, 290.
Hoplocephala bicornis, **284**.
Hormaphis hamamelidis, 263.
Hornia, 232.
Hybernia defoliaria, **353**. leucophaearia, **192**.
Hybroma, 256. servulella, 256.
Hydrachna geographica, 207.

globum, 207. puteus, 207.
Hydrobius, 16.
Hydrochelidon lariformis [aves], 18.
Hydroecia nictitans, 230.
Hydrometra paludum, **66**.
Hydrophilus triangularis, 227.
Hydropsyche. 317.
Hyla pickeringii [batr.], **235**, 345.
Hylaeus, **88**.
Hylesinus trifolii, 96.
Hyloicus dollii, 38.
Hylotoma rosa, 18.
Hyperchiria io, **275** (v. Saturnia f.). lama, 229. varia, **275**.
Hyperetes tessellatus, **52**.
Hyphantria textor, **280**.
Hypoderma, **305**, **307-310**.
diana, **308**. bovis, **314**, 322.
Hypotrichia, **215**, **217**, 345.
spissipes, **215**, **216**, 345.
Hyptiotes, 319.
Ichneumon, 117, 289, 290. hunterae, 117. tharotis, 117.
Incurvaria mediostriatella, 257.
Inocellia, **160**.
Ips fasciatus, 285. sanguinoleutus, **285**.
Ischnus, 290.
Isosoma hordei, 263.
Ithomeis, 229.
Ithomia, **191**.
Iulus, **248**, 289.
Ixodes testudinis, **64**.
Jassus. 58. borealis, 58. flaviceps, 58. fuscipennis, 58. gratiosus, 58. melanotus, 58. pustulatus, 58.
Jolia, 171.
Joppa, 289.
Julopis cretacea, **248**.
Junonia coenia, **99**, **338**, 342. lavinia, **99**.
Kampecaris forfarensis, **116**, 188.
Kermes galliformis, 98.
Labena, 290. apicalis, 290.
grallator, 290.
Laccobius, 16.
Lachnosterna, **215**. fusca, **211**, **224**, 296, 347, 350 (v. Phyllophaga f.).
Lachnus australi, 15.
Lacon leprosus, **25**.
Lagynoptervx valdiviana, 229.
Lampronota, 290.
Lampyris, 137. noctiluca, 210.
plerandidula, 210.
Laphria, 264.
Laphygma frugiperda, 57, 98.
Larinus maculatus, **332**. melicus, **332**.
Larra tarsata, 78.
Larrada luteipennis, 292.
Larunda, 56. solituda, 56.
Lasconotus, 171.
Lasiocampa potatoria, **235**.
Lasioptera solidaginis, 138, 149.
Lasius interjectus, **19**, 346. niger, **252**, **300**.
Laverna, 317. cephalanthiella, 317.
Lecanium acericorticis, 227, 232. hesperidum, 15. phyllococcus, 15.
Leistus rufomarginatus. 38.
Lema trilineata, 209, 259.
Lemonias nais, **133**. palmerii, 294.
Lepasta, 174.
Lepisma, 5, **353**.
Leptarctia lena, 56.
Leptis, 173.
Leptophlebia, 171.
Leptoris, 257.
Leptura abdominalis, **221**. cordifera, **204**. emarginata, **204**. zebra, **204**.
Lestomyia, 264.
Leucania hispanica, 260. nonagrioides, 260. straminea, 260. unipuncta (unipunctata ‡), 210, 295.
Leucanthiza saundersella, 317.
Leucarctia acraea, **59**.
Leucoma salicis, 260.
Leucopis phylloxerae, 262.
Leucospis, 292.
Leucothyris paula, 326.
Libellula, 18, **111**, 293. depressa, 325. quadrimaculata, 18, **191**, 296, 325. rufa, **191**.
Lichnanthe lupina, 325.
Ligonia, 174.
Ligyrus, **146**.
Limacodes caesonia, 322. flexuosa, 322. latomia, 322. scapha **279** (v. Eulimacodes s.).
Limenitis, 209. arthemis, **14**, **99**, **282**, 325. disippus, **14**, **51**, 117, 209, 347. eros, 16. eulalia, 294. floridensis, 16. proserpina, **99**, 293, 319. sibylla (sibilla ‡), 137, **192**. ursula, 293, 325.
Limneria chrysosticta, **91**.
Limnobia, 173.
Limnocharis, 16.
Limonius, **146**.
Limulus, 172, **253**, 296.
Linosta, 174.
Linyphia, 259.
Liocranoides, 260. unicolor, 260.
Liopasia, 174.
Liparis, 171, 255. auriflua, 263. chrysorrhea, 228 (v. Porthesia ch.). detrita, 260. dispar, 260. rubea, 260.
Lipeurus bacilus, 174.
Lissorhoptrus simplex, 98, 118.
Lithobius forficatus, **235**, 352.
Lithocollectis, **72**, **74**, **243**, 256, 316, 317. aesculisella, 316. ambrosiaecella, 316. bethunella, 316. caryae-albella, 316. celtitoliella, 316. celtisella, 316. cincinnatiella, 316. clemensella, 316. coryliella (corylisella), 316. guttifinitella, 256, 316. nonfasciella, 316. ornatella, 316. ostryaecella, 316. tiliaecella, 316. tritaenianella, 316. ulmella, 316. virginiella, 316.
Lithosialis brongniartii, 190.
Lobophora viretata, **87**.
Lomatia, 188.
Lonchaea polita, **241**.
Lophocarenum, 259.
Lophomma, 259.
Lophomonas [infus.], **298**.
Lozogramma tripunctaria, 56.
Lozotaenia, 257. cerasivorana, 38. musculana, **242**.
Lucanus cervus, **236**, 350. dama, 18, **186**, 320. elaphus, 189.
Lucilia hominivorax, **29**, **114**. hominivorus, **29**. macellaria, **27-30**, **350**,* **350****(v. Musca m.).
Lycaena, 293, 294. alce, 294. alexis, 136. amica, 293. ardea, 294. argus, **300**. behrii, 294. daunia, 294. echo, 293. fea, 294. fulla, 294. glaucon, 294. gyas, 294. helios, 294. icarus, **92**. kodiak, 294. lucia, 293. lycea, 293. 294. inertila, 293. mintha, 294. neglecta, 293. 294. orcus, 294. pembina, 294. pseudargiolus, 293. rustica, 293. scudderii, 294. shasta, 294. speciosa, 37. viaca, 294. violacea, 293, 319.
Lychnosea, 322. aulalaria, 322.
Lycogaster, 291. costalis, 291. gundlachii, 291.
Lycomorpha constans, 57. desertus, 57.
Lycosa gyrophora, 208. noctes, 208. violaceus, 208.
Lyctus striatus, 292.
Lygranthoecia spraguei, 57.
Lyonetia, **74**, 256. saccatella, 317. speculella, 256.
Lysana, 174.
Machilis, 5, **353**.
Macrobasis murina, 209. unicolor, 209.
Macrodactylus subspinosus, **285**.
Macropis, 162. ciliata, 162. labiata, **312**. patellata. 162.
Macrosila carolina, 259 (v. Sphinx c.).
Macrotera, 290.
Macrotoma, **354**. plumbea, 339, **354**.
Madarus ampelopsidos, 118.
Malachius, 260.
Mallophora, 264. orcina, 78.
Mallota posticata, **241**.

Mamestra legitima, 38. lilacina, 38. liquida, 38. mimula, 322. vittula, 322.
Mantis, **313**. carolina, **281**.
Marmara, 256. salictella, 256.
Masaris edwardsii, 289. marginalis 291. occidentalis, 291. texanus, 291. vespiformis, 290. vespoides, 290, 291. zonalis, 291.
Mastogenius subcyaneus, **203**.
Mecas inornata, **222**.
Mechanites, **191**.
Megachile, **88**, 290, 291. armaticeps, 292. curta, 292. tibialis, 292.
Megacilissa nigrescens, 292. subaurata, 292.
Megastigmus, **91**. dorsalis, **90**.
Megatoma serra, **9**.
Melanippe montanata, 137.
Melanomma auricinctaria, 321.
Melanoplus atlantis, 78. cinereus, 78. devastator, 78. packardii, 78.
Melanotus, **284**. communis, **284**. parumpunctatus, **284**.
Melecta, **88**, 290.
Melicleptria honesta, 57.
Melinaea, 229.
Melipona, **251**. scutellaris, **298**.
Melissodes, 290. menuachus, 289. mimicus, 292.
Melitaea, **201**, 260, 294. anicia, 37, 294. arachne, 294. athalia, **192**. baroni, 37. colon, 37, 326. chalcedon, 294.
Melitaea dwinellei, 37. fulvia, 319. marcia, 294. pallida, 293. perdiccas, 37, 326. phaeton, 137, **354**. phaon, 293. picta, 293. quino, 37. rubicunda, 37, **354**. sterope, 294. texana, 293. tharos, 117. thekla, 294. vesta, 294. wheeleri, 37.
Melittia, 350.* cucurbitae, **303-304**, 350* (v. Aegeria c.).
Melolontha, 296. vulgaris, 17, 264.
Melophagus, 173, **308**.
Meniscus, 290.
Mentzelia ornata, 188.
Meracantha contracta, **284**.
Merapioidus, 264.
Meristhus lepidotus, **25**.
Mermis, **225**. acuminata, **352**. nigrescens, **353**.
Merodon barbus, **241**.
Mesembrina, 173.
Mesoleptus, 289, 290.
Mesostenus, 290.
Meta argyra, 260.
Metrocampa margaritata, 56. perlata, 56.
Miastor, 173.
Micaria limnicunae. **191**.
Micrattacus fulviventris, 229.
Microepeira, 319.
Microcentrum retinerve, 227.
Microgaster, 117, 162. atalantae, 117. carinata, 117. carduicola, 117. gelechiae, 117, 162. lunatus, 117. pieridis, 117.
Microneta, 259.
Microplitis, 117. ceratomiae, 117. gortynae, 117.
Micropus leucopterus, 209.
Mimallo cordubensis, 229.
Mimetus, 259.
Mindora, 174.
Misumena importuna, 260.
Molorchus bimaculatus, **204**.
Monedula insularis, 292.
Monocrepidius lepidus, **25**.
Monoleuca sulfurea, 322.
Monumetha, 291.
Mordellistena erratica, 326. fusco-atra, 326. pratensis, 326 splendens, 326. tarsalis, 326.
Morinia, **285**.
Morpho, **114**, 350.
Moschus [mamm.], **310**.
Musca, **29**, 173, **218**, 296. caesar, **218**, 347. domestica, **113**. macellaria, **114** (v. Lucilia m.).
Mutilla, 290.
Mygale hentzii, **176**.
Mygnimia, 291.
Myopa, 173.
Myrmecophila, **133**. pergandi, **133**.
Myrmica lineolata, **14**.
Mytilus edulis [moll.], 16.
Napeogenes, 229.
Nasua socialis [mamm.], 264.
Nausigaster, 264.
Nebria trifaria, **338**.
Necrobia rufipes, **234**.
Necrophorus tomentosus, 325.
Nematus, **89**. curtispina, 171, 325. mendicus, 118. pavidus, 171. pentandrae, **91**. quercicola, 118. salicis-pomum, 118. ventricosus, **48-51**, 347. viduatus, **91**.
Nemocphila russula, **192**, 345.
Neoclytus erythrocephalus, **221**.
Nemognatha immaculata, **146**.
Neophrida, 174.
Nephopteryx zimmermani, 322.
Nepticula, **72**, **74**, 256, 257. bifasciella, 256. fuscotibiella, 256. platanella, 256, 257. saginella, 257.
Neuroterus, 254.
Nezara virides, **312**.
Niptus hololeucus, 319.
Nisoniades, 58. **104**. icelus, 58. juvenalis, 58. naevius, 58. petronius, 58. propertius, 58. somnus, 58.
Nitela, 328.
Noctua, **72**, 150. xylina, (v. Aletia x.).
Nola fuscula, 57. sorghi 118.
Nomada, 290, 291. bisign 208.
Nomia apacha, 289. nort 289.
Nonagria, **14**.
Nonnus, 290.
Notocyphus, 291.
Notodonta concinna, 18, **2** dictaea, 96, **279**. ziczac, 32
Notommata werneckii [r **333**.
Notonecta, **225**, **338**. g ca, **66**, 172.
Notoxus bicolor, **146**. m don, **146**.
Nudaria, **314**.
Nycteribia, 173.
Nyctobates pensylvanica, **2** Oberea, 162.
Ochsenheimeria, **73**.
Ocneria dispar, **201**.
Ocypus olens, **314**.
Odonestis potatoria, 264.
Odontomerus, 290.
Odynerus cingulatus, 292. bensis, 292. dejectus, 292. finodus, 289. tous, 289.
Oecanthus, **99**.
Oeceticus platensis, 229.
Oecophora pseudospretella,
Oedemasophaga, **351**. aeg lis, 350,* **351**.
Oedicephalus, 289.
Oedipoda atrox, 78. oblite 78. pellucida, 78.
Oeme rigida, **204**.
Oeneis bore, **268**, 342.
Oenectra distincta, 318. irr 318. striata, 318.
Oenosanda noctuiformis, 55
Oestromyia, **309**.
Oestrus, **309**, **310**. hom 209. leporinus, **310**. ovis, :
Oeta compta, 77.
Ogyris genoveva, **300**.
Oiketicus abbotti, 322.
Oligarces, 173.
Oligoneura rhenana, 97.
Olinx fulvicrus, **90**. g rum, **90**, **91**.
Oncocnemis, 38. aqualis, chandleri, 38. major, 38.
Oncomyia, 264. baroni, modesta, 264.
Onthophagus nuchicorn **225**.
Operophtera boreata, **243**.
Ophion, 117. macrurum. 277. tityri, 117.
Opostega, **74**, 256. albo riella, 256.
Orgyia antiqua, 37, 137.

229. badia, 37. cana, 37. fasce-
lina, 260. gonostigma, 260. gu-
losa, 37. leucostigma, 230. 280,
317. nova, 37. pudibunda, 137.
vetusta. 37.
Oribates. 56. aspidioti, 15.
opiparus, 56. versutus, 56.
Ormyrus gastris, 90.
Ornix, 256.
Orthosia instabilis, 273. sig-
nata, 295.
Orthosoma cylindricum, 209.
Ortopelma, 91. luteolator, 91.
Oryx virginiana [aves], 209.
Orycles, 216.
Osiris, 290.
Osmia, 88, 208, 290. 291.
Otiorhynchus ligneus, 233.
Oxylaemus, 171.
Oxymorpha, 90.
Ozognathus cornutus, 149, 174.
Pachygnatha tristriata, 260.
Pachyprylla, 262. celtidis-
mamma, 260, 262. celtidis-ven-
usta, 262. venusta, 262.
Pachypus, 217.
Pachytylus migratorius, 78.
Paedisca, 318. giganteana,
318. similana, 241. solicitana,
241. transmissana, 241.
Palingenia. 319.
Palpipes, 249.
Paltostoma, 188. torrentium,
188.
Pamphila accius, 256. arpa, 56,
256. attalus, 294. brettus, 256.
delaware, 256. draco, 294. leon-
ardus, 56. licinus, 294. macu-
lata, 256. mardon, 37. palatka,
256. phyleus, 256. rurea, 294.
siris, 37. straton, 56. verna, 294.
Panorpa, 103.
Panorpodes oregonensis, 173.
Pantala flavescens, 312.
Panthera pardalaria, 217, 345.
Panurgus, 290. nevadensis,
290.
Papilio, 32, 117, 289. asterias,
117, 260, 295, 298. bairdii, 293.
cresphontes, 17, 99, 137, 317,
342. damon, 294. ecclipsis, 38.
glaucus, 233, 294. grayi, 261.
nachaon, 17, 192, 201, 230,
280. pammon, 263. philenor,
145, 160, 230, 232. podalirius,
260. polydamas, 312. turnus,
117, 233, 283, 293, 294.
Parnassia subatomaria, 272.
Parapompilus naomi, 291.
Parectopa, 317. robiniella, 256.
Paria aterrima, 123, 126-
130, 344.
Parnassius, 313. behrii, 294.
sayii, 293. smintheus, 294.
Parnus auriculatus, 229.
Parotermes, 190. fodinae, 190.
hagenii, 190. insignis, 190.
Passalus cornutus, 320.
Passer domesticus [aves], 151.
Patrobus longicornis, 325.
Pauropus, 245.
Paussus, 75.
Pediculus, 230. cervicalis, 209.
humanus, 209. pubis, 209.
Pelecocera, 264.
Pelopoeus, 189, 254. architectus, 313. laetus, 254. lunatus, 210.
Pempelia contatella, 321. grossulariae, 77, 321. lignosella, 118. quinquepunctella, 321.
Pemphigus, 190, 318. populicaulis, 323. pyri, 190. rhois, 118. ulmifusus, 118. vagabundus, 118. vitifoliae, 207.
Pentastoma constrictum, 208. denticulatum, 208. settenii, 208. taenioides, 208.
Penthetria, 57. majuscula, 57. parvula, 57.
Penthina albeolana, 242. capreana, 242. cyanana, 174. dimidiana, 242. impudens, 318. vitivorana, 77, 209.
Pepsis, 291. formosa, 210.
Perdita, 290. albipennis, 289. zonalis, 290.
Peripatus, 17, 245.
Periplaneta americana, 261.
Petalopoda, 58.
Petaserpes, 318. rosalbus, 318.
Pezomachus, 137.
Pezotettix borckii, 78. flavoannulatus, 172. pacificus, 78.
Phaeogenes ater, 57.
Phalangites, 249.
Phalangium, 208.
Phaneroptera curvicauda, 240.
Phedosia, 174.
Pheidole providens, 252.
Phellopsis obcordata, 284.
Pheosia rimosa, 279.
Phiditia, 174.
Phigalia lixaria, 322.
Philampelus, 227. achemon, 55. satellitia, 18.
Phileremus, 290. productus, 290.
Philhydrus, 16.
Philodromus lentiginosus, 260.
Philothermus, 171.
Phlebotomus, 230.
Phloeonemus, 171.
Phoberia atomaris, 97.
Phobetron pithecium, 280.
Pholcomma, 259.
Phryganea, 288.
Phryganidea californica. 56.
Phthirius inguinalis, 5.
Phyciodes canace, 294. camillus, 294. emissa, 294. nycteis, 319. orseis, 294. picta, 354.
Phygadeuon, 290.
Phyllobrotica vittata, 162.
Phyllocnistis, 72-74, 256, 317. ampelopsiella, 317. liriodendronella, 256. vitifoliella, 317.
Phyllophaga fusca, 295 (v. Lachnosterna f.).
Phyllophorus testudinatus, 5.
Phyllotoma microcephala, 332. vagans, 171.
Phyllotreta nemorum, 210. striolata, 207, 210.
Phylloxera, 104, 144, 233. caryaeglobuli, 263. caryaesemen, 207, 263. vastatrix, 259, 260, 262. vitifoliae, 133-134, 139, 143, 207, 230, 260, 262, 263, 339, 349.
Phymata erosa, 228, 317.
Phytodietus, 290.
Phytonomus, 96, 97. punctatus, 96, 97.
Phytoptus, 333, 334. pyri, 262. quadripes, 262.
Pieris, 163. brassicae, 323. bryoniae, 57. calyce, 294. crataegi, 174. hulda, 294. menapia. 79. monuste, 16, 97. nasturtii. 293. protodice, 326. rapae, 66, 117, 228, 295. spilleri, 163, 342. vernalis, 293. virginiensis, 294.
Pilemia, 174.
Pimpla, 91, 162, 290. brevicornis, 91. inanis. 90, 91. mandibularis, 91. vesicaria, 91.
Pinipestis reniculella, 322.
Pionea rimosalis, 295.
Piophila casei, 207.
Pipiza radicum, 190.
Pirates biguttatus. 209.
Pirene, 162.
Pissodes strobi, 229.
Placonia, 174.
Plagiodera scripta, 222.
Plagodis floscularia, 38.
Planiceps, 291.
Plathypena scabra, 97.
Platygaster, 70, 347.
Platynota stultana, 318. semiustana, 318.
Platypteryx, 278. bilineata, 278. lacertula, 278.
Platysamia columbia, 298. nokomis, 298. polyommata, 326.
Platyptilia bertrami, 190, 229. dichrodactyla, 190.
Platytermus, 91. fasciculatus, 90-91. simplex, 90.
Plectrocnemia, 317.
Plectrodes, 217, 345.
Pleocoma. 217, 345.
Pleurhomus. 326. obscurus, 326. sahlbergi, 326.
Ploas, 5.
Plusia, 69, 228. bonacrensis, 229. brassicae, 19, 57, 77. celsa, 56. gamma. 18. ni, 57, 77. verticillata, 323.

Podapion, 149. gallicola, 149.
Podura, **5**, 117.
Poecilosoma pulveratum, 171.
Pogonomyrmex barbatus, 15, 161.
Polia. 295. illepida, 295.
Polistes flavus, 289. navajoe, 289. rubiginosus, 210.
Polymitarcys alba, 97.
Polyphylla, **146**. variolosa, **23**, **159**, 342.
Polyrachis, 320.
Polysphincta, 290. tuberosa, 136.
Pomatinus substriatus, 229.
Pomphopoea sayi, 325.
Pompilus, 117, 161, 291.
Ponera, **99**.
Porthesia auriflua, 260. chrysorrhoea, 317 (v. Liparis ch.). similis, 317.
Potamophilus, **111**.
Priocnemis, 291.
Prionus, **159**, 341. imbricornis, 209. insularis, 18. laticollis, 209.
Proarna montevidensis, 55. uruguayensis, 55.
Proctacanthus, 264.
Prodenia autumnalis, 57.
Prodoxus, 171. decipiens, 136, 149, 150.
Promachus, 264. bastardii, 150. vertebratus, 150.
Pronous, 260.
Pronuba, 171. yuccasella, **105**, 136, 149, 150.
Propexus edonis, 321.
Prorasea simalis, 321.
Prosopistoma, 111. punctifrons, 173.
Pryteria, 174.
Pseudaglossa lubricalis, 322. scobialis, 322.
Pseudapistosia, 174.
Pseudeuceron, 174.
Pseudoconchylis, 318. laticapitana, 318.
Pseudodryas, 174.
Pseudohazis eglanterina, 56, 322.
Psiloptera drummondi, **24**, **63**, 342.
Psilopus pallens, 324.
Psinidia wallula, 78.
Psithyrus, **88**.
Psoloptera meisteri, 229.
Psylla, 293. celtis-grandis, 262. celtidis-mamma, 259, 260. ulmi, **310**, 323. venusta, 260.
Pterochilus lewisii, 289.
Pterogon clarkiae, 55.
Pteromalus, 117, 137. puparum, 117. quadrimaculatae, 16.
Pterophorus monodactylus, 229.
Pterostichus melanarius, **234**.
Ptinus fur, 228. rutilus, **43-44**, 342.
Ptosima gibbicollis, **203**.
Ptycholoma, 257. dissitana, 322. persicana, 38.
Ptyelus, **288**.
Publilia concava, 326.
Pulex, 55. cavicola, 264. concoloris, 264. irritans, 95, **186**, 209. nasuae, 264. obscurus, 264. penetrans, **52**, 209, 261, 341. testudo, 264.
Pulvinaria innumerabilis, **224**, **226**, 258, 348.
Purpuricenus axillaris, **204**. humeralis, **204**, 229.
Pycnomerus, 171.
Pygoctenucha, 322. funerea, 322.
Pyralis aegalis, **351**. aegusalis, **351**.
Pyrameis atalanta, 117. cardui, 95, 117. huntera, 117.
Pyrgus, **104**. philetas, 37.
Pyrophorus, 339.
Pyrrhosoma minium, **211**.
Pyrrhia stilla, 322.
Pyrrhotaenia achillae, 56. eremocarpi, 56. fragariae, 56. helianthi, 56. meadii, 56. orthocarpi, 56. polygoni, 56. tepperi, 56. texana, 56.
Pyrsonympha [infus.], **298**.
Quadrina, 57. diazoma, 57.
Ragadia crisia, **148**, 343.
Raphidia, **166**.
Reduvius personatus, 209.
Retinia, **14**, 263. duplana, 320. frustrana, 257, 263. rigidana, 257. sylvestrana, 320.
Rheumaptera hastata, **243**.
Rhingia, 173.
Rhinoceros [mamm.], **310**. sumatrensis, **351**.
Rhipiphorus, **224**, 350. limbatus, **211**, 347. pectinatus, **211**, 347.
Rhizococcus fossor, **297**.
Rhizotrogus solstitialis, **211**, 316.
Rhodites, 162. bicolor, 150. rosae, **91**, 150. radicum, 162.
Rhodobaenus tredecimpunctatus, 96, **222**, 350.*
Rhodocera cleopatra, 17. rhamni, **236**, 350.
Rhododipsa miniana, 57.
Rhodophora florida, 172.
Rhoënanthus, 171.
Rhopalodes argentina, 229.
Rhopalosoma, 291.
Rhynchophorus zimmermanni, 96.
Rhyssa, 290. atrata, **147**. humida, **280**.
Sabulodes dositheata, 56.
Salticus, **5**, **64**.
Samia californica, **314**. ceanothi, **314**. cecropia, 231, **312** **313**, **314**, 350* (v. Attacus c.). gloveri, **314**.
Sandalus petrophya, **203**.
Saperda bivittata, 316. fayi, 17. scalaris, **44**.
Sapholytus connatus, **91**.
Sarcophaga carnaria, **4**, 324.
Sarcopsylla penetrans, 190.
Saturnia carpini, 38, 173. io, 231 (v. Hyperchiria i.). mendocino, 56. pavonia, 88. promethea, 295.
Satyrus alope, 293. ariane, 293. boopis, 293. charon, **354**. gabbii, 294. nephele, 293. pegala, 293. ridingsii, 293 (v. Hipparchia r.).
Scaeva, 173.
Scarabaeus tityus, **145**.
Scelio famelicus, 78.
Scelodonta nebulosa, **123**, **126**, **128-130**, **167-168**, 344. pubescens, **167-168**, 344.
Schizoneura lanigera, **144**, 190. pyri, 190.
Schizopyga frigida, 290.
Sciaphila arizonana, 318.
Sciapteron cupressi, 56. graefii, 56. scepsiformis, 56. syringae, 56.
Sciara, 258. ocellaris, 258. titicola, 258.
Sciurus hudsonius [mamm.], 323.
Sclerostoma syngamus [verm.], **75**.
Scolia nobilitata, 289. consors, 289. flavocostalis, 289. flavosignata, 289. lecontei, 289. regina, 289. ridingsii, 289.
Scoliopteryx libatrix, 37, 321.
Scolopendrella, 17.
Scolytus pyri, 190.
Scops asio [aves], 293.
Scorpio, **253**, 296.
Scotocryptus, 297. meliponae, 297, 298. obscurus, 297, 298.
Scutigera, 326.
Segestria, 208.
Segestrioides, 260.
Sejus cynipidis, 15.
Selandria barda, 261. rubi, 295.
Selenophorus ellipticus, 323.
Selenops insularis, 260.
Semasia, 318.
Semiotellus chalcidiphagus, 263.
Senia, 174.
Sericoris, 257. urticana, **241**.
Sialis sialis [aves], 320.
Sialis, 188.
Silpha americana, 325.
Simondsia paradoxa [verm.], **93**.
Simulium, **39**, **79**, 173, 228, 230. reptans, **225**.

Singa, 319.
Singamia, 174.
Sirex, 296, 316.
Sitaris, 161.
Smerinthus, 17, **69**, **282**, 325, **335**. cablei, 17. excaecatus, **277**, **282**. geminatus, **282**. ocellatus, 325. ophthalmicus, 55. populi, 18, **201**.
Smicra, 292. gigantea, 15.
Smodicum cucujiforme, **203**.
Smyra, 174.
Solenobia, 256. walshella, 256.
Sosylus, 171.
Spalacopsis suffusa, 97, 98, 118.
Spalangia quadrimaculatae, 16. syrphi, 16.
Spaniophlebia, 171.
Spathegaster baccarum, **90**. quercus-laurifoliae, 15.
Sparasion famelicus, 78.
Sphaerularia bombi [verm.], **79**, **93**, **337**.
Sphenophorus, 96, 97. robustus, 96, 97, 259. sculptilis, 259. zeae, 259.
Sphenostethus taslei, **203**.
Sphex ichneumonea, 210. mandibularis, 292.
Sphida obliquata, 56.
Sphinx, 325. baruta, 229. carolina, 209 (v. Macrosila c.). catalpae, 96. chersis, 320. convolvuli, **164**. dollii, 38. drupiferarum, **226**. ephemeraeformis, 257. eremitus, 320. hageni, 98. libocedrus, 56. ligustri, 173. oreodaphne, 55. perelegans, 55. quinquemaculata, 209, 318. sequoiae, 36. utahensis, 56.
Spilosoma isabella, **281** (v. Arctia i.). virginica, **281**.
Spiropalpus, 259.
Spragueia pardalis, 38.
Statira, **39**.
Steatoda, 259.
Steganoptycha, 257.
Stelis, 290, 291. interrupta, 290. montana, 290.
Stenobothrus, 296.
Stenoctenus, 260.
Stenus, **19**, 344.
Stereoptes skada, 294.
Stigmonota, 257.
Stilpnus, 289.
Stizus, **338**. grandis, 210. speciosus, 210, 320.
Stomoxys, 173, 230. calcitrans, **328**.
Strangalia, 296.
Stratiomys, 173.
Strix perlata [aves], 264.
Strobisia levipedella, 256.
Strongylium, **39**.
Strongylus pergracilis [verm], **75**.
Strophocerus, 174.
Stylogaster, 264. neglecta, 264.
Subula, 173.
Sychesia, 174.
Sympiezus sericeicornis, **91**.
Synalissa, 174.
Syneda faceta, 56. occulta, 56.
Synedoida valens, 56.
Synergus, **90-91**. apicalis, **90**. connatus, **91**. facialis, **90**. nervosus, **90**. thaumacerus, **90**. vulgaris, **89-90**.
Syneta tripla, **283**.
Syntomaspis, **90-91**. cyanea, **90**. fastuosa, **90**. saphirina, **90**.
Syrichtus alba, 293. oceanus, 294. petreius, 294.
Syrphus pensylvanicus, 16. pyrastri, 324. quadrimaculata, 16.
Systoechus, 198. oreas, 78, 189.
Tabanus, **69**, 172. 296. dodgei, 210. sparus, 210. superjumentarius, 210.
Tachina aletiae, 228.
Taczanowskia, 260.
Taeniocampa gothica, 136. incerta, **273**.
Talmenia, 174.
Tamias striatus [mamm.], **226**, **338**.
Tamyodes, 174.
Tanypus nebulosus, **225**.
Tarentula nidifex, 16. pikei, 16.
Taxonus glabratus, 171.
Tegenaria guyonii, **54**, **206**, 346. textura, 208.
Tegeticula yuccasella, 136, 149, 150 (v. Pronuba y.).
Telea polyphemus, 231, 232, **313**, **314**, 350* (v. Attacus p.).
Teleas, **99**.
Telenomus brochymenae, 315.
Telephorus bilineatus, **284**.
Telesilla cinereola, 259.
Tenaga, 256. pomiliella, 256.
Tenebrio molitor, 187, **354**.
Tenthredo, 316.
Tenthredoides, 289.
Tephrosia biundularia, 172. crepuscularia, 172.
Teras ferrugana, 242. niveana, 242.
Terias nicippe, 18.
Termes, 190.
Terulia, 58.
Tetracha carolina, **219**.
Tetracis aegrotata, 56.
Tetragnatha, 319. illinoiensis, 260.
Tetralopha diluculella, 321.
Tetramorium caespitum, **32**.
Tetrapedia, 290.
Tetrastichus, **90**. terminalis, **90**.
Tettigades papa, 55.
Thagona, 174.
Thais polyxena, 260.
Thalpochares aetheria, 322.
Thamnonoma tripunctaria, 56.
Tharops obliquus, **203**.
Thecla acadica, 294. affinis, 294. alcestis, 294. autolycus, 294. behrii, 294. calanus, 117. californica, 294. castalis, 294. chalcis, 294. citima, 37. clothilde, 293. cygnus, 294. damon, 294. dryope, 294. exoleta, 37. irus, 37. henrici, 56. laeta, 294. mossii, 37. muiri, 37. nelsoni, 37. ninus, 294. ontario, 294. spadix, 37. tacita, 37. tetra, 294. viridis, 294.
Thelia univittata, **240**.
Thelidora, 174.
Thelyphonus bohemicus, **226**.
Thereva, 173.
Theridion (Theridium), **66**, 208, 259. gonygaster, 259. migratum, 208. schizopoda, 208. sphaerula, 259.
Theridula, 259. gonygaster, 259. sphaerula, 259.
Thomisus bigibbosus, 260.
Thraulus, 171.
Thrips, **195**.
Thyatira lorata, 57.
Thymalus fulgidus, **285**. limbatus, **285**.
Thymeticus hylax, 294.
Thyreodon morio, **282**.
Thyreus abbotii, **104**, **186**.
Thyridia, **191**.
Thyridopteryx, 257. ephemeraeformis, 257. meadii, 56.
Tillomorpha geminata, **204**.
Timetes coresia, 294. eleucha, 294.
Tinea, **72-73**, 256. crinella, **39**, 343. granella, **146**, 150. pellionella, 256. rusticella, 256. tapetzella, **72**.
Tineola biselliella, 256.
Tingis juglandis, **241**.
Tiphia, **211**, **224**, 347, 350.
Tipula, 173
Tischeria, **72**, **74**. 317. quercitella, 256.
Titanophasma fayoli, **54**.
Tmeticus, 259.
Tomicus, **164**.
Tomocerus, **354**.
Tomopteryx viduaria, 229.
Tortrix, **90**. cinderella, 77. dissitana, 322. flaccidana, 38. nigridia, 320. quercifoliana, 38. zebeana, **332**.
Torymus, **91**. bedeguaris, **91**. cingulatus, **89-90**. euchlorus, **90**. flavipes, **89**. glechomae, **91**. nigricornis, **90**. viridissi-

mus, **89-90.**
Toxophoroides, 290.
Trachys, **332.**
Tremex columba, **285.**
Trichodectes ovis, 97.
Trichogramma, **51.** minutissimum, 117. minutum, **51**, 117, 347. pretiosa, **51**, 347.
Trichonympha [infus.], **298.** agilis, **298.** leidyi, **298.**
Trichorthosia, 322. parallela, 322.
Trichotaphe alacella, 256. flavocostella, 256.
Tricypha, 174.
Trigonalys, 291. costalis, 291. gundlachii, 291. pulchellus, 291.
Trigonaspis, **90.** crustalis, **90.**
Trimerotropis caeruleipes, 78. latifasciata, 78. similis, 78. vinculata, 78.
Triocnemis, 57. saporis, 57.
Triodites, 188. mus, 78, 189.
Trioza, **310.** maura, 323. remota, 323. scottii, 323.
Triphosa dubitata, 56.
Trochilium grande, 18. pacificum, 56.
Trogoderma tarsale, **39**, **132**, 345, 350.**
Trogon ‡, v. Trogus.
Trogosita corticalis, **285.**
Trogoxylon parallelipipedum, 292.
Trogus, 17, 289. exesorius, 117. flavipennis, 290.
Trombidium, 78, **324.** fuligi-
nosum, **14.**
Tropaea luna, **94**, **313**, 350.*
Tropisternus, 326. breviceps, 326. dorsalis, 326. fulvipalpis, 326. lancifer, 326. limbalis, 326. obscurus, 326. parananus. 326. proximus, 326. robustus, 326.
Trothisa margaritae. 229.
Trox, **146.**
Trychodactylus, **206.**
Trypeta asteris, 149. polita, 138. pomonella, 257, 258. solidaginis, 138, 149, 162.
Tryphon, 289, 290.
Trypoxylon, 189, 323. albitarse, 189, 210. sulcus, 172.
Turdus migratorius [aves], 320.
Tylenchus [verm.], **333.**
Tylonotus bimaculatus, **204**, **283.**
Tympanoterpes elegans, 55.
Typhlocyba, 190. aurea, 190. binotata, 190. pallidula, 190.
Typholodromus oiliioorus, 15.
Tyroglyphus, **206**, 261. gloverii, 227.
Ulamia, 174.
Ulesanis, 259.
Uloborus, 319.
Ulochlaena hirta, **163.**
Urocerus areolatus, 289.
Valeria conserta, 38.
Valgus squamiger. **24**, 342.
Vanessa, **104**, **201**, 260, 296. antiopa, **14**, 117, **282.** atalanta, 292. cardui, 18, **84.** 174, **312**, **352.** gonerilla, 323. io, 260, **352.** milberti, **100.** polychloros, **192**, **234**, 352. urticae, 137, 263, **352.**
Vespa, 55, 296. crabro, 228. maculata, 210.
Vespertilio isidori [mamm.], 264.
Viteus, 207. vitifoliae, 207.
Wala, 323.
Walshia, 257. amorphella, 117, 150.
Wilsonia, 257.
Xanthothrix neumoegeni, 56.
Xenos, 228.
Xorides borealis, 290.
Xylina antennata, 57. cinerea, 57.
Xylocopa, 290. azteca, 290. californica, 290. virginica, 292.
Xylonomus, 290.
Xylotrechus colonus. **283.** convergens, 17.
Xyphidria attenuata, **286.**
Xysticus feroculus, 260. vernilis, 260.
Xystus robiniae, 56 (v. Cossus r.).
Ypsipetes sordidata, **352.**
Ypsolophus, 256.
Zarnea fasciata, **175**, 349.
Zenodoxus canescens, 56. heucherae, 56. potentillae, 56.
Zerene elegantaria, 56.
Zeugophora reineckei, 321.
Zeuzera, **106.**
Zilla x-notata, **300**, 341.
Zophodia, 57.

CORRECTIONS.

The passages indicated should read as follows. Errors in mere punctuation, capitalization, division of words, and turned letters are not noticed.

p.	col.	l.	
9	1	—13	which do not imbricate. . . .
29	1	20	(*Compsomyia*) *macellaria* . . .
64	2	— 1	. . . spider, *Clubiona*
71	1	—12	. . . On page 37 he . . .
73	1	5	. . . *Tinea*, *Exapate*,
95	folio line		. . . [3292-3302]. . .
108	2	— 9	. . . Special bibliography. . . .
123	1	4	nebulosa Lec.
128	2	1	. . . SCELODONTA NEBULOSA Lec.
167		3	THREE *EUMOLPINI*. . .
168	1	1	. . . *S. nebulosa*, . . .
168	2	5	. . . changed to *nebulosa*
168	2	8	. . . of *nebulosa* only.
213		9	**Vol. 4. Nos. 126-128.**
215	2	14	. . . took it in my . . .
237		6	. . . FORBES, *Champaign*,
257	folio line		. . . [3695-3704] . . .
269		6	. . . FORBES, *Champaign*.
301		6	FORBES. *Champaign*,
333	1	6	. . . Julius edler von
333	1	11	ges. in Wien, 1876, . . .

EXPLANATION OF PLATE 1.

FIG. 2. *Scelodonta nebulosa* Lec.

FIG. 3. Pupa of *Scelodonta nebulosa*.

p.	col.	l.	
14	1	16	. . . *Limenitis disippus* . . .
18	2	7	des jahres 1879. . . .
19	1	— 8	DR. M. SCHULGIN . . .
31	1	16	. . . that it was . . .
32	2	— 2	bage.—Compiled . . .
36	1	—11	SPÅNGBERG. Jacob. . . .
39	1	3	gnats [*Simulium* sp.] . . .
54	1	12	American *solpugidae*, . . .
55	2	—26	. . . **1879, v. 11**: . . .
57	2	34	. . . Professor Riley on
59	1	20	Faune des coléoptères . . .
59	1	22	the rhynchophora which...
59	2	— 3	. . . in flight. Siewers'
76	2	12	Equador. by Mr. . . .
78	1	5	. . . 24 × 15; map
79	1	13	helminth parasitic . . .
79	1	30	PROF. PHILIPP CHRISTOPH . . .
94	1	3	Dr. Leuthner, of Basle, . . .
94	1	11	Dr. Leuthner considers ...
98	1	—17	. . . and 1882, 1882 [Jan.
98	1	—11	. . . stalk-borer: genus-
98	2	2	*Anomis erosa* Hüb. . . .
117	2	2	. . . p. 418-419,
117	2	—19	. . . 6 Apr. 1881.
120	1	14	. . . in powdered form, . . .
135	2	6	. . . [Paris, 1875.] . . .
136	2	2	Laboulbène. . . .
150	2	— 3	. . . Sept. 1881. v. 1, p. . . .
151	1	16	ogists' union has . . .
151	2	21	. . . third numero of
151	2	—11	If any enthusiasts . . .
152	1	23	. . . and explaining in . . .

152 1 24 . . . to make Leuckart
161 2 3 . . . 1 pl., 23 X 14.5. . . .
172 1 17 . . . 1 col. pl., 25 X 16.5, t
172 2 —14 kohls, *apocynum* . . .
173 1 27 . . . 59 pl., 26 X 16. t 20 X 11.5.
174 1 22 terlings-fauna . . .
178 2 16 C. H. T. TOWNSEND,
187 2 —22 p. 157-161, pl. 1.)
187 2 — 5 . . . p. 162-168, pl. 2-3.)
188 2 —16 . . . nouvelles plantes-
190 1 10 . . . 1884], v. 15, p. 231-233, . . .
206 1 5 sciences of Philadelphia, . . .
208 2 4 . . . t 17 X 9.5. il.
211 2 19 . . . by the larva of
211 2 20 . . . or *R. limbatus*, the
223 2 —14 . . . student after another
225 1 21 . . . that of *Euchro-*
225 2 —12 *nuchicornis* from . . .
228 1 31 . . . and to decomposing . . .
232 1 1 [**Instinct** or . . .
234 2 5 . . . Aubert and R. Dubois . . .
235 1 21 . . . two myriopods in cap—
235 2 24 . . . "Mr. B. T. Lowne gave
235 2 — 2 Mr. Wood-Mason . . .
248 22 GEOLOGICAL DISTRIBUTION . . .
258 2 — 5 . . . p. 198-201 . . .
264 1 2 . . . rhopalocera of . . .
264 1 27 . . . u. kunst pro
287 2 12 . . . In 1877 he . . .
287 2 30 . . . and then would
291 1 — 6 . . . genus *aleiodes*,
293 2 13 America. No. 2. . . .
294 2 29 v. 3, p. 266-277.)
296 2 35 . . . 2d article.
297 1 6 *Santalum cunninghamii*, . . .
313 2 — 6 of *Pelopoeus architectus*, and
315 2 1 **Beijerinck**, M. W. . . .
317 1 —26 . . . (Feuille des . . .
318 1 15 . . . Russell, esq., on the hes-
324 1 21 antérieur des . . .
325 1 11 by. the colours, . . .
325 1 — 3 *dum*, Fab. . . .
340 1 27 . . . p. 122, 142, 154. 166, 178, 194.
341 1 29 . . . 166, 330, *each* 4 cm.)
350* 2 3 330, *each* 2 cm.)
350**1 —13 . . . 81, 330, *each* 3 cm.)
351 2 6 fessor G. V. Ciaccio, . . .
352 2 —16 PARASITIC NEMATODS—..
354 1 17 . . . *Melitaea rubicunda*,
354 2 — 1 . . . 21 Feb. 1887.
355 4 [Copyright, 1889, by . . .
356 1 5 . . . Bůžek, 4143.
356 2 — 1 ten 3291*r*. . . .
358 1 —20 **429,4. Hebrew**. . . .
361 2 16 **589,2.** FUNGI.
362 1 18 . . . Arachnida, 3825.
362 1 19 . . . Bolito-
364 2 31 . . . Zeugophora, 3979.
364 2 — 4 . . . Sejus.
364 2 — 3 . . . Leuco-
368 1 34 Prizes, 4106-4107. . . .
372 2 3 . . . 3745. Chryseudeto 3983 . .
372 2 33 . . . [H]abrostola. 3734.
374 1 37 oxys, 3502. . . .
374 2 25 . . . Equus, 3998.

16 1 11 tions other *aphididae* . . .
16 1 12 . . . enemies of *aphididae* . . .
16 1 13 *aphididae*. . . .
16 1 25 . . . species of *chalcididae* . . .
17 2 —11 . . . *pontederia* in Louisiana; . . .
38 1 8 . . . corrects error of . . .
56 1 6 . . . *ctenucha rubroscapa*
57 2 21 . . . *H. E.* (3265)
78 2 —20 . . . G. de Lucretiis' . . .
95 2 3 . . . use of naphthalin (C_{10} H_8) . . .
137 2 — 7 . . . to the action
150 1 11 . . . [Rec., 3339].—The
150 1 19 . . . described by R. Mc-
150 1 — 3 . . . *teyeticula yuccasella* . . .
150 2 —17 . . . oviposit at
161 1 —27 tural skill (exemplified . . .
161 2 —17 *lamium album* . . .
171 1 — 7 jolia, rhoënanthus,
171 1 — 4 . . . and baëtis; . . .
173 1 — 3 the insect [*prosopistoma* . . .
173 1 — 2 . . . aquatic life."
174 2 — 2 . . . of *aphididae*.
189 1 22 . . . formerly attributed to . . .
190 1 — 3 . . . p. 369, ulcerous . . .
200 2 18 laboratory by . . .
207 2 15 Process of oviposition . . .

p.	col.	l.	
209	1	11	fields; past . . .
209	2	— 2	. . . of larva, pupa . . .
209	2	— 1	*pias* its food-plant. . . .
228	1	24	. . . of *darlingtonia californica*, . . .
229	1	19	. . . upon *platyptilia bertrami* . . .
229	2	35	10 new species, viz.: . . .
230	1	14	of certain *acridiidae*. . . .
231	2	— 4	. . . of insects from . . .
232	1	— 5	important points from . . .
257	1	20	. . . *dasycera, anesychia,*
259	2	—13	. . . *psylla celtidis-*
261	1	—11	1884. Honey when sealed . . .
262	2	— 7	*tidis-*]*venusta* . . .
263	2	1	**Wallace**, Alfred Russel, . . .
263	2	—14	. . . mites; quotation of other
264	1	— 1	. . . and *pelecocera*. . . .
292	1	28	. . . July 1863, p.
292	1	34	. . . *"apis griseicollis"* ♀ = . . .
292	1	35	. . . *cus* ♀ ; *"apis* . . .
293	2	—17	. . . *l. pseudargiolus*, and . . .
294	1	24	. . . *argynnis* and to the *lycaena.*
294	2	32	. . . *thecla ninus* ♂, . . .
316	1	23	. . . 9 new species of . . .
318	1	22	. . . *B: P.M.* (3929)
321	1	7	opment of the larva. . . .
322	1	13	describes *alypiodes* (n. g.) . . .
322	1	— 5	currence of . . .
323	1	10	. . . of Claparède's "haftnäpfe," . . .
323	2	18	. . . for "the apple
324	2	— 3	. . . *agaonidae;* synonymy of . . .
325	2	29	ing the occurrence and . . .
326	1	18	(Colombia); creates . . .
326	2	31	Résumé of the . . .
344	1	—16	. . . *scelodonta nebulosa* (misnamed. . .
344	1	— 4	. . . *scelodonta nebulosa* as
345	1	— 3	p. 278, of a communication made . . .

p. 329, line 14, for *Frank Karsch* read *Ferdinand Anton Franz Karsch.*

p. 330, col. 2, line 37, for PYSCHE read PSYCHE.

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146	61—72	June	"	8 June	"
147—148	73—96	July-Aug.	"	18 Aug.	"
149—150	97—120	Sept.-Oct.	"	9 Nov.	"
151—152	121—144	Nov.-Dec.	"	12 Dec.	"
153	145—156	Jan.	1889.	11 Jan.	1889.
154—155	157—180	Feb.-Mar.	"	8 Mar.	"
156	181—200	Apr.	"	15 Apr.	"
157—159	201—228	May-July	"	28 July	"
160—164	229—284	Aug.-Dec.	"	2 Jan.	1890.
165	285—300	Jan.	1890.	21 Jan.	"
166	301—318	Feb.	"	14 Feb.	"
167—168	319—334	Mar.-Apr.	"	20 Mar.	"
169	335—348	May	"	10 May	"
170	349—364	June	"	11 July	"
171	365—380	July	"	19 Aug.	"
172—174	381—406	Aug.-Oct.	"	20 Oct.	"
175—176	407—442	Nov.-Dec.	"	3 Dec.	"

CONTENTS.

ANONYM. Editorial note 13
Insect Life 90
Classified list of food plants of American butterflies, drawn from Scudder's "Butterflies of the eastern United States" 274–278
Entomological Society of London 300
Insects of Bermuda 317
Palaearctic Lepidoptera 332
The genus Argynnis 348
Edwards's Bibliography of Transformations 401–402
Lowne's Anatomy of the blow-fly 442
ASHMEAD, WILLIAM HARRIS. The corn Delphacid, Delphax maidis. *Figure.* . 321–324
ATKINSON, GEORGE F. The use of two doors in a trap-door spider's nest. . . 88–89
Notes on protective resemblances in spiders 147–148

BASSETT, HOMER FRANKLIN. A short chapter in the history of the Cynipidous gall-flies 235–238
BEUTENMÜLLER, WILLIAM. Description of the larva of Osmoderma scabra, Beauv. . 281
Descriptions of some new North American moths 299–300
Description of the larva of Megalodacne fasciata, Fabr 317–318
Note on two species of Datana 401
BIBLIOGRAPHICAL RECORD . 15–22: 31–34: 45–46: 57–58: 91–94: 115–118: 140–143: 154–155
BLANCHARD, FREDERICK. Some account of our species of Geotrupes . . . 103–110
Observations on some variations of the males in Clinidium . . . 165–166

COCKERELL, T. D. A. Habit of Vespa 348

DIMMOCK, ANNA KATHERINA. Variable number of molts in insects . . . 28–29
DIMMOCK, GEORGE. A Sphaerularia-like worm 14
Another nuisance 24
Odorous butterflies 35
Necrology 35–36: 156
Coloration of cocoons and pupae 60
Value of private collections 72
Effect of consanguinity in Lepidoptera 150–151
Packard's Entomology for Beginners 151
Luminous eggs of insects 169–170
Phosphorescence of Myriopods 170
The meconium of butterflies 170
Household pests 170

CONTENTS.

ANONYM. Editorial note 13
Insect Life 90
Classified list of food plants of American butterflies, drawn from Scudder's "Butterflies of the eastern United States" 274–278
Entomological Society of London 300
Insects of Bermuda 317
Palaearctic Lepidoptera 332
The genus Argynnis 348
Edwards's Bibliography of Transformations 401–402
Lowne's Anatomy of the blow-fly 442
ASHMEAD, WILLIAM HARRIS. The corn Delphacid, Delphax maidis. *Figure.* . 321–324
ATKINSON, GEORGE F. The use of two doors in a trap-door spider's nest. . . 88–89
Notes on protective resemblances in spiders 147–148

BASSETT, HOMER FRANKLIN. A short chapter in the history of the Cynipidous gall-flies 235–238
BEUTENMÜLLER, WILLIAM. Description of the larva of Osmoderma scabra, Beauv. . 281
Descriptions of some new North American moths 299–300
Description of the larva of Megalodacne fasciata, Fabr 317–318
Note on two species of Datana 401
BIBLIOGRAPHICAL RECORD . 15–22: 31–34: 45–46: 57–58: 91–94: 115–118: 140–143: 154–155
BLANCHARD, FREDERICK. Some account of our species of Geotrupes . . . 103–110
Observations on some variations of the males in Clinidium . . . 165–166

COCKERELL, T. D. A. Habit of Vespa 348

DIMMOCK, ANNA KATHERINA. Variable number of molts in insects . . . 28–29
DIMMOCK, GEORGE. A Sphaerularia-like worm 14
Another nuisance 24
Odorous butterflies 35
Necrology 35–36: 156
Coloration of cocoons and pupae 60
Value of private collections 72
Effect of consanguinity in Lepidoptera 150–151
Packard's Entomology for Beginners 151
Luminous eggs of insects 169–170
Phosphorescence of Myriopods 170
The meconium of butterflies 170
Household pests 170

DYAR, HARRISON G. Preparatory stages of Cerura multiscripta, Riley . . . 393–395
Notes on two species of Datana, with descriptions of their larval stages . 414–420
The number of molts of lepidopterous larvae 420–422

ELIOT, IDA M., and SOULE, CAROLINE G. Variation of color in the larvae of Sphinx gordius 228
ELWES, HENRY JOHN. The Argynnides of North America 308–317
EMERTON, JAMES HENRY. Habit of Vespa. *Figure* 54
Habits of Mygale in confinement 55
Photographs of cobwebs 71–72
The study of species and the study of cells 77–78
Walckenaer's names of American spiders 113–114
Pairing of Xysticus triguttatus. *Figure* 169
New trap-door nests of spiders 333
An internal dipterous parasite of spiders. *Figures* 404
ENTOMOLOGICAL ITEMS. . 23–24: 35–36: 47–48: 59–60: 71–72: 95–96: 119–120: 144: 156
ENTOMOLOGICAL NOTES. 200: 363–364: 379–380: 405–406

FORBES, STEPHEN ALFRED. On the present state of our knowledge concerning contagious insect diseases 3–12
A new parasite of the Hessian fly. *Figure* 39–40
Note on chinch bug diseases 110–111
The American plum borer, Euzophera semi-funeralis, Walker. *Figures* 295–299

GILLETTE, C. P. Notes on certain Cynipidae, with descriptions of new species. *Figures* 183–188: 214–221
Parasitism of Hippodamia convergens 279
A new Cecidomyiid infesting box elder (Negundo aceroides) *Figure* . 392–393
GRASSI, BATTISTA. A contribution towards a knowledge of Termites . . . 250–255

HAGEN, HERMANN AUGUST. The pioneer painter of North American insects . . 134–135
Lac insects 168
The female of Eutermes rippertii 203–208
Synopsis of the Odonata of North America, No. 1 241–250
" " " No. 2, the genus Anax . 303–308
Otiorhynchus sulcatus injurious to plants in greenhouses in Massachusetts 333–338
Two species of Aeschna 353–355
Descriptions of some North American Cordulina. *Plate* . . . 367–373
Notes and descriptions of some North American Libellulina . . . 383–387
HAMILTON, JOHN. Electric light captures 149–150
HENSHAW, SAMUEL. Two European weevils new to the United States . . . 137
HINKLEY, HOLMES. Note on Melitaea phaeton. 54
Maculation and pupation of Smerinthus excaecatus 152–153
Second brood of Callosamia promethea 280
Observations on Saturnia io 318
HOLLAND, W. J. Descriptions of new West African Lycaenidae 423–431

DYAR, HARRISON G. Preparatory stages of Cerura multiscripta, Riley . . . 393-395
Notes on two species of Datana, with descriptions of their larval stages . 414-420
The number of molts of lepidopterous larvae 420-422

ELIOT, IDA M., and SOULE, CAROLINE G. Variation of color in the larvae of Sphinx gordius 228
ELWES, HENRY JOHN. The Argynnides of North America 308-317
EMERTON, JAMES HENRY. Habit of Vespa. *Figure* 54
Habits of Mygale in confinement 55
Photographs of cobwebs 71-72
The study of species and the study of cells 77-78
Walckenaer's names of American spiders 113-114
Pairing of Xysticus triguttatus. *Figure* 169
New trap-door nests of spiders 333
An internal dipterous parasite of spiders. *Figures* 404
ENTOMOLOGICAL ITEMS. . 23-24: 35-36: 47-48: 59-60: 71-72: 95-96: 119-120: 144: 156
ENTOMOLOGICAL NOTES. 200: 363-364: 379-380: 405-406

FORBES, STEPHEN ALFRED. On the present state of our knowledge concerning contagious insect diseases 3-12
A new parasite of the Hessian fly. *Figure* 39-40
Note on chinch bug diseases 110-111
The American plum borer, Euzophera semi-funeralis, Walker. *Figures* 295-299

GILLETTE, C. P. Notes on certain Cynipidae, with descriptions of new species. *Figures* 183-188: 214-221
Parasitism of Hippodamia convergens 279
A new Cecidomyiid infesting box elder (Negundo aceroides) *Figure* . 392-393
GRASSI, BATTISTA. A contribution towards a knowledge of Termites . . . 250-255

HAGEN, HERMANN AUGUST. The pioneer painter of North American insects . . 134-135
Lac insects 168
The female of Eutermes rippertii 203-208
Synopsis of the Odonata of North America, No. 1 241-250
" " " No. 2, the genus Anax . 303-308
Otiorhynchus sulcatus injurious to plants in greenhouses in Massachusetts 333-338
Two species of Aeschna 353-355
Descriptions of some North American Cordulina. *Plate* . . . 367-373
Notes and descriptions of some North American Libellulina . . . 383-387
HAMILTON, JOHN. Electric light captures 149-150
HENSHAW, SAMUEL. Two European weevils new to the United States . . . 137
HINKLEY, HOLMES. Note on Melitaea phaeton. 54
Maculation and pupation of Smerinthus excaecatus 152-153
Second brood of Callosamia promethea 280
Observations on Saturnia io 318
HOLLAND, W. J. Descriptions of new West African Lycaenidae 423-431

JACK, JOHN GEORGE. Notes on Croesus latitarsus, Norton, and description of the larva 41-42
Emphytus cinctus in America 279

MCNEILL, JEROME. The male element the originating factor in the development of species 269-272
MANN, BENJAMIN PICKMAN. Migration of Aganisthos acheronta 168
MARTEN, JOHN. Description of Asphondylia helianthi-globulus 102-103
MAYNARD, CHARLES J. Notes on the white ant, found on the Bahamas . . 111-113

PACKARD, ALPHEUS SPRING. Identification of the Notodontian genus Schizura of Doubleday 53
On the occurrence of organs of taste in the epipharynx of the Mecaptera (Panorpa and Boreus) 159-164
Duration of life in an Ephemera 168-169
Notes on the epipharynx and the epipharyngeal organs of taste in mandibulate insects 193-199: 222-228
The partial life-history of Pseudohazis eglanterina with remarks on the larvae of allied genera 325-327
The life-history of Seirarctia echo 351-353
Notes on the early stages of two Sphingidae 396-401
PROCEEDINGS OF SOCIETIES. Cambridge Entomological Club . 44: 55-56: 69-70: 138-139: 153: 282-283
Colorado Biological Association 228: 283-284
Entomological Society of London 56

RIVERS, J. J. The Argynnides of North America 328-329

SCUDDER, SAMUEL HUBBARD. Feeding habits of a Lycaenid caterpillar . . . 13
Egg laying of Limenitis disippus 30
The natural history of Anosia plexippus in New England . . . 63-66
The means employed by butterflies of the genus Basilarchia for the perpetuation of the species. 79-85
The arrangement of the New England species of Thanaos . . . 86-88
Hibernation of Theclidi 137
Inaccurate figure of a butterfly's egg 152
Some new comparisons of Pieris oleracea with Pieris napi . . . 166-167
Cosmopolitan butterflies 190-192
Power of vision in Vespidae 279-280
The work of a decade upon fossil insects—1880-1889 . . . 287-295
Diary of a hibernating butterfly 330-332
The fossil insect localities in the Rocky Mountain region 363
Do flies migrate? 402-403
Some genera of Oedipodidae rescued from the Tryxalidae . . . 431-442
SMITH, JOHN B. Notes on the structure and habits of Haematobia serrata. *Figures* 343-347
Notes on some Aphid structures. *Figures.* 409-414
SMYTH ELISON A., JR. Notes on Colias eurytheme and C. philodice . . . 334
Notes on the southern distribution of some common butterflies . . 347-348

Psyche, A Journal of Entomology.

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PSYCHE.

ON THE PRESENT STATE OF OUR KNOWLEDGE CONCERNING CONTAGIOUS INSECT DISEASES.

BY STEPHEN ALFRED FORBES, CHAMPAIGN, ILL.

[Annual address of the retiring president of the Cambridge Entomological Club, 14 January 1887.]*

It seems to have been from the beginning characteristic of the Cambridge Entomological Club that, without undervaluing taxonomic work, our members have chosen for themselves the field of biological entomology. Not content with the mere orderly arrangement of the facts of insect structure in the form of a comparative anatomy or of a classification, we have been especially interested, as a rule, I think, in the attempt to philosophize such facts; to trace them to their causes and to follow them to their effects. Sympathizing heartily with this tradition of the society, I have selected as the principal topic of my address a subject requiring us to consider the insect as a living organism, in active vital relation to the living organic world,— a subject which frees us in great measure from the technical harness of a classification, and must even lead us quite beyond the borders of entomological science. It is one of those outlying subjects which come within the range of a *frontier patrol*, interested in the foreign relations of insect life, whether those of peaceful commerce or of depredation and defence. Topics of this sort are the food relations of insects and, allied to this, the captivating subject of their relations to flowers. Here also belongs the complex subject or group of subjects included under economic entomology; and here comes, of course, the special topic of this address, — that of contagious insect disease.

Contagious disease, wherever it has been traced to its origin, has proved to be a phenomenon of parasitism; and is included, consequently, under the general head of the interactions of organisms.

Rejecting the many cases of parasitism which have no very serious effect on the insect host, whether because the parasites are in their nature insignificant, or because — as in the case of the termites and many wood-eating species — the organism seems to have adjusted itself to continuous and extraordinary parasitism; and further excluding — since the outlines of our subject must at best be arbitrary — parasitism by other insects, I shall limit myself to cases of true disease of an epidemic and uncommonly destruc-

* For bibliography accompanying this address see the BIBLIOGRAPHICAL RECORD, p. 15.

tive character which have been traced to fungus or protozoan parasites as their causes.

Within these limits, I will undertake to summarize briefly existing knowledge concerning the leading forms of contagious insect disease, with such references to foreign literature as may be necessary, and with a fuller analysis of our scanty American contributions.

Of the protozoan diseases of insects, *pébrine* of the silkworm is the best known example, — an affection which has for the insect world a character so deadly as quite to overshadow any form of animal parasitism known among human kind. It is a plague rapidly and easily conveyed by contamination of the food, and exceedingly liable to hereditary transmission through infection of the forming egg in the ovary, — differing in this latter respect from any other insect affection known to me.

First clearly distinguished about thirty years ago, it has been thoroughly studied in most of its relations, and is now described, as it occurs in the silkworm, in every general work on silk culture, a very intelligent summary of its characters being given, for example, in Maillot's *Leçons sur le ver à soie du mûrier*. The best detailed description which I have seen of its symptoms and histology is that by Quatrefages in his *Études sur les maladies actuelles du ver à soie** (p. 229-306), to be read, however, in connection with Pasteur's critical remarks in his *Études sur les maladies des vers à soie* (v. 1, p. 99-106).

Its most evident symptoms are, externally, the peculiar black specking of the skin, from which it derives its name, and, internally, the appearance of similar black spots on the organs generally; and, in the blood, of the peculiar spores of parasites ("corpuscles" of Cornalia) to be mentioned later. Its characteristic pathological features are (1) the more or less extensive disorganization of the gastric epithelium, within whose cells the parasites begin their development; and (2) the general invasion of nearly all the internal tissues by these parasites and their spores, which also become abundant in the blood. At death the body has a certain elasticity quite in contrast with the flaccid condition of larvae dead with other forms of contagious disease. After death it mummifies without decay, and without that efflorescence of spores especially characteristic of muscardine and allied diseases.

The food of healthy insects may become infected by the discharges of diseased larvae, or even, at a considerable distance, by the dust of their excrement. The "germs" of the disease may also be introduced by means of accidental punctures of the skin, as larvae crawl over each other with claws soiled with their spore-laden excrement.

Concerning the characteristic para-

*Mémoires de l'Académie des sciences de l'Institut impérial de France, tome 30.

sites of this disease, an unusual number of conflicting views have been held by successive writers. Leydig was the first to suggest their affinity with the psorosperms of fishes in 1857, but they were afterwards claimed by botanists and described, once as an alga (*Panhistophyton ovatum*), by Lebert, and again by Naegeli, as one of the Schizomycetes or bacteria (*Nosema bombycis*). Even in so recent and authoritative a work as that by Cornil and Babes, *Les bactéries, et leur rôle dans l'anatomie et l'histologie pathologiques des maladies infectieuses*, published in 1885, this view of Naegeli is taken, and the spores are classed as bacteria. But, since the thorough-going researches of Balbiani on their life-history, continued from 1867 to 1883, I think that there can be no longer a reasonable doubt of their animal nature, or of their agreement in general characters with those forms now commonly included under the head of *sporozoa*,—a parasitic subdivision of the protozoa, of which *Gregarina* is perhaps the best known type.

The fullest and most satisfactory account of their very simple life-history is that given by Balbiani three years ago, in his discussion of the *Microsporidia* in the *Journal de micrographie* (1883, v. 7, p. 313-323, and p. 404-411). It may be thus briefly summarized:—

The minute oval spores, colorless, highly refractile, homogeneous in appearance, 4 μ long by 2 μ wide, when swallowed with the food, penetrate in some way unexplained the cuticle of the alimentary canal, and, in the cells of its epithelium, open at one end and emit their contents, each in a form of an amoeboid speck of protoplasm. This grows to a spherical body and, by a process of internal segmentation common to the *sporozoa*, is soon converted into a mass of spores, each like the original. These spores everywhere undergo a like development, and load all the tissues with their products, slowly and gradually arresting all the functions of life. Their vitality is temporary—Pasteur's experiments showing that they will not germinate five weeks after drying out—and the disease is consequently maintained only by virtue of its hereditary character.

This microsporidion, or an extremely similiar one, produces an epizootic disease also in the oak silk-worm (*Attacus pernyi*), in France, in that species, however, being unable to penetrate beyond the epithelial layer of the intestine, and hence not appearing in the blood or in the tissues at large. Other forms of microsporidia have been found in *Coccus hesperidum;* in *Tipula pratensis;* in *Zygaena filipendula;* in two orthopterous insects (*Decticus griseus* and *Gryllus campestris*); in *Emus olens*, a coleopterous species; in the arachnid *Epeira diadema*; in the entomostraca, *Polyphemus pediculus*, *Simocephalus vetulus* and *Chydorus sphaericus*; in the genital tubes of a nematoid worm; and even, according to Vlacovich, in a colubrine snake (*Coluber carbonarius*).

That epizootic attacks are not more

frequently caused by them, is doubtless due to the sparse distribution and the isolated occurrence of many of these species.

Balbiani gives us in his latest work on this subject the interesting and important information that he has often succeeded in conveying *pébrine* to other insects by treating their food with the dejections of affected silkworms. *Bombyx neustria* he found more susceptible than the silkworm itself, but another bombycid, *Liparis chrysorrhoea*, proved wholly refractory, seemingly because the cuticular lining of the intestine is there unusually thick. Dipterous maggots, larvae of ants, and the meal worm (*Tenebrio molitor*) were also used by him in similar experiments, but quite without result.

I have myself, this year, attempted to convey *pébrine* of the silkworm to various other species, obtaining my material for infection from pupae a few days dead, reared by myself from worms conspicuously diseased. Larvae of *Telea polyphemus*, the fall web worm (*Hyphantria textor*), the common cabbage worm (*Pieris rapae*), the caterpillars of the thistle butterfly (*Pyrameis cardui*), various species of cutworms (*noctuidae*), and both adult and larval *Doryphora*, were infected, sometimes by way of the food, sometimes by puncturing the skin, but in every case without positive success. I obtained, it is true, one curious result; my specimens of *Melolontha*, *Pieris*, and *Telea* all developed unmistakably the characteristic specks and spots of *pébrine* subsequent to infection, but the most critical and protracted search of their fluids and tissues failed to discover the slightest evidence of parasitism,—a fact which I could only explain on the hypothesis that the marks on the skin were due to the direct action of the material ingested or injected from the silkworm, and not to any morbific substance elaborated within the bodies of the insects experimented upon.

You will perhaps allow me to add an item upon the possible economic applications of this disease. There is not the slightest probability that the *sporozoa* can be artificially cultivated outside the bodies of the animals which they may infest; neither have we yet any sufficient proof that forms normally occurring in one species will multiply or permanently maintain themselves in any other. We are consequently limited, practically, to artificial measures for developing and accelerating this disease wherever it may be found, and to more careful and extended experiments for its transfer from the silkworm to related noxious species.

The American literature of *pébrine* is an absolute blank, not a single item of new information concerning it having been published on this side of the water, nor a single observation of its occurrence in this country in any other form than in the common silkworm having been placed on record, as far as I can find.

The notable fungous diseases of in-

sects are readily divisible into two principal groups; schizomycoses, produced by bacteria, and hyphomycoses, due to fungi which form a more or less evident mycelium of cylindrical threads (*Hyphomycetes* and *Pyrenomycetes*). These are roughly distinguishable in two important particulars: (1) The bacteria invade the body from within, by way of the alimentary canal; and the thread fungi penetrate from without through the skin or spiracles; (2) Death from a schizomycosis is followed by rapid decay, which soon reduces the tissues to a putrid fluid; while after death from a hyphomycosis the often flaccid body hardens and mummifies without decay, usually swelling to more than its usual size, and frequently becoming covered with a flour-like efflorescence of spores or spore-like bodies. These last characters distinguish the hyphomycoses from the *pébrines*,—the body mummifying in the latter, but shriveling at the same time and never covering itself with spores, unless with those of a common mould of *post mortem* development. Further, the *pébrine* mummy contains only the minute oval spores of the parasite, while that of a hyphomycosis contains either a mass of mycelial threads or large thick-walled, spherical spores,—the lasting spores of an *Entomophthora* or, possibly, both spores and mycelium together.

Muscardine, longest-known of insect diseases — often a cause of astounding destruction both to domesticated and native species, and by far the most promising natural agent for the artificial restriction of noxious insects—is caused by a number of fungous forms—*Botrytis*, *Isaria*, *Cordyceps*,—several species of each—the classification and ontogenetic relations of which are not yet wholly settled. Some *Botrytis* forms have been unmistakably connected with some Isarias as an earlier developmental stage, and other *Botrytis* forms have been as clearly connected with *Cordyceps*, while all the entomochthonous Isarias are classed by Cooke as *Cordyceps* in a vegetative stage; but, on the other hand, the longest-known *Botrytis*—that of silkworm muscardine —has never been followed, that I can find, beyond an *Isaria* stage, and other species are in doubt. Hence, as one consciously beyond the limits of his proper territory, I will touch these dubious and contested matters in the lightest way, endeavoring only to get at and apply the very important entomological data which the cryptogamic botanists have incidentally worked up for us.

Generalizing the life histories of these fungi and their modes of attack on the living insect structure (which is for most of them the indispensable substratum of their later growth), we may say that they invade their hosts from without—or, sometimes, by the spiracles and tracheae — but never, so far as known, by way of the alimentary canal; that their minute spores germinate on the surface and send inward through the cuticle slender threads which grow through the body wall and then separate into small single cells—cylindrical conidia—that these pass everywhere, growing, dividing and again dividing as they go, deriving their nutri-

ment from the tissues and the blood, rendering the latter distinctly acid, as a rule;—and that death slowly supervenes.

After this event, these conidia elongate, producing mycelial threads with which the body soon becomes stiffened and distended. Then they shoot upward through the skin a forest of little stems, fertile hyphae, which may branch much or little, according to the form, often covering the dead insect with a microscropic pile like that of velvet. From these hyphae other spore-like bodies—spherical conidia—are variously budded off, borne on the stems and branches singly, in heaps, in necklace strings, forming finally a dense powdery layer of cell-like particles, white or greenish, often excessively delicate and minute—in the silk-worm species not more than 2 μ or 3 μ in diameter. Here the development may stop—as it usually seems to do, indeed, in the best known form,—the *Botrytis bassiana* of the silkworm muscardine—the conidia detached germinating elsewhere, if they fall on favorable conditions, and directly reproducing this lowly vegetative stage. Under other conditions—sometimes on other insects—(the silkworm fungus on *Gastropacha rubi*, for example)—the fertile hyphae, instead of forming an infinitesimal surface pile, spring up in strong club-shaped tufts, bearing conidia on their threads—this being the so-called *Isaria* stage. Finally, the mycelium within the dead body of the insect may thicken, forming one or more compact masses, from which a strong stipe may spring up—like that from the mouth of the white grub (*Lachnosterna fusca*), of which all have seen examples, or at least illustrations—and at the end of this stipe, immersed in a head more or less distinct, another form of spores—ascospores or thecaspores — may be borne by a more complicated apparatus of reproduction. This is the final reproductive stage—the *Cordyceps*—best illustrated by our *Cordyceps melolonthae** of the common white grubs. These ascospores carry the fungus species over winter; but seem not always necessary to this end, as the spherical conidia of the *Botrytis* stage of the silkworm muscardine have been known to retain their vitality more than a year.

All these reproductive bodies—ascospores and conidia — of *Cordyceps*, *Botrytis*, and *Isaria*, have germinated freely again and again in sweetened water, in sterilized beer-mash, in solutions of gelatine and of gum, and may even grow to some extent in pure water. In these artificial cultures the *Botrytis* stage arises, and may form its spherical conidia in vast abundance; and these have been used with perfect success for the infection of healthy insects in great variety.

Perhaps the most notable of these laboratory experiments have been made by Tulasne, De Bary, and Elias Metschnikoff—names of an authority so high as to leave not the slightest doubt of the correctness of their statements or the soundness of their results. Excluding the experiments of the older authors, made when the existing knowledge of these fungus species was probably insuf-

* SACCARDO, Sylloge fungorum, v. 2, p. 576.

ficient for accurate experiment, we find that these pyrenomycetous fungi have been found in one or more of their stages, spontaneous or as a consequence of experiment, on various hymenoptera, —*vespidae*, *sphegidae*, *formicidae*, *ichneumonidae*,—on larvae of *Papilio*, *Pieris*, *Anthocharis*, *Liparis*, *sphingidae*, *bombycidae* (especially the silkworm and *Gastropacha rubi*), *noctuidae*, and *tineidae* among the lepidoptera,—on dipterous pupae,—on adult or larval *carabidae* (*Calathus*), *staphylinidae*, *coccinellidae*, *melolonthidae* (*Anisoplia* and *Lachnosterna*), and other lamellicorns,—on larvae of *Tenebrio molitor*, *Saperda*, and *Buprestis*, —on *rhynchophora*, including especially *Cleonus* larvae and *Apion*. Various *orthoptera* have been found subject to them,—hemipterous insects,—a *Cicada*, and several *coccidae* (infested by *Sphaerostilbe coccogena*), —and, finally, *Mygale*, *Epeira*, and *Phalangium* among the *arachnida*.

The *Botrytis* and *Isaria* stages are remarkable for the number of insect species which each fungus species may infest,—differing sometimes as widely as larval *tenebrionidae* and *bombycidae*. The fact also that they are not strictly dependent upon living insects as the basis of their growth, but may, at least in the *Botrytis* stage, germinate and form their spherical conidia on moist surfaces elsewhere, makes them especially effective agents of contagion.

Among the most valuable papers on this topic are those by Turpin and by Audouin (Ann. sc. nat.; Zool., 1837, v. 8; and *Comptes rendus*, 1836, p. 170); those by Vittadini (Giorn. Institut. lombard., v. 3, p. 143); by DeBary (*Botanische Zeitschrift*, 1867 and 1869); and by Metschnikoff (*Zoologische anzeiger*, 1880, p. 44).

The American contributions are descriptions of species by Ravenel (Linnæan transactions, 1856, p. 159); descriptions and biological notes by Peck (N. Y state mus. repts. for 1875 and 1879); a description by Peck of a new genus and species of fungus allied to *Cordyceps* (*Appendicularia*) infesting *Drosophila* (Science, v. 4, p. 25); various notes on the prevalence of *Cordyceps melolonthae* Tul., on white grubs—including a mention and figure of this fungus as a new species (*Torrubia elongata* Riley)—in an agricultural weekly; a general article by Riley, on *Cordyceps* (Amer. entom., 1880, v. 3, p. 137); a note by Riley, (Rept. U. S. commiss. agr., 1883, p. 119) reporting the occurrence of spontaneous muscardine on *Plusia rimosella*—the same article containing the description of *Botrytis rileyi* by Dr Farlow; and, finally, an illustrated note on a coccid parasite belonging to *Cordyceps*, by Zabriskie, in the New York journal of microscopy (Vol. 1, 1886, p. 89). Additional minor memoranda will be found in the bibliographical list given with this paper.

The insect diseases which are probably most commonly noticed are those due to the *entomophthoreae*; nine tenths of the adult and larval insects found dead and stiff on fences, weeds, grass, etc., in ordinary collecting, being, according to my observation, victims of

these parasites. They are so well known as represented by the common house-fly fungus, *Empusa muscae*, that I may pass them rapidly by. The insect parasites of this group are variously classified: reduced by Winter to a single genus (1881); distributed by Brefeld (1884) among three genera; and divided by Eidam (1886) into four.

Concerning their methods and apparatus of attack on the insect body, I need only note their similarity to those of the *Botrytis* forms of the preceding group—internal and external conidia, the latter germinating externally or in the tracheae—the penetrating hyphae and subsequent mycelium;—the differences are insignificant to the entomologist. The conidia have, however, this important practical peculiarity; that they very soon lose their power of germination, the species being preserved from year to year by lasting-spores—(large, thick-walled, spherical cells forming within the insect body, dark in some cases, discoloring the blood); or else by the hibernation of diseased individuals, in whose bodies the fungus parasite is preserved until the following year. In grasshoppers, noctuid caterpillars, cicadas, and the like, these lasting spores almost completely fill the body after death, the mycelium which developed them shriveling away. Destructive epidemics due to these fungi have been noticed among grasshoppers—especially *Oedipoda* and *Pezotettix*; among various noctuid larvae—especially *Agrotis segetum* in Europe and some American cut-worms; among the two European cabbage worms (*Pieris rapae* and *P. brassicae*); among various diptera—the common house-fly, blow-flies, *syrphidae*, *Culex*, and even *Chironomus* larvae; and, finally, among *coccidae* and aphides—*Aphis corni* and *Aphis rumicis*—these last occurrences suggesting to the agricultural entomologists of France the use of *Entomophthora* for the destruction of the phylloxera.

These *Entomophthora* forms have proved, thus far, much more difficult of cultivation artificially than the other fungus parasites, the only successful attempt within my knowledge being that made by Brefeld in 1884. In his Entomophthorae (p. 72) he tells us that after many unsuccessful trials he succeeded at last in cultivating them in sterilized veal soup, the mode of growth and of conidia formation being identical with that in the body of the living fly.

In his *Botanische untersuchungen* for 1881 he describes (p. 98) an infection experiment with the conidia of *Entomophthora radicans* applied to one hundred and twenty cabbage caterpillars, with the consequence that eighty-one speedily died of the fungous disease resulting.

In this country, three species only have been described; one by Peck from the *Cicada* (Rept. Botanist, N. Y. state mus. nat. hist., 31, p. 19), first reported, however, by Leidy, in 1851 (Proc. Acad. nat. sci. Philad., v. 10, p. 235); one by Bessey in *Pezotettix* (Amer. nat., v. 17, p. 1280); and one by Arthur from *Phytonomus punctatus* (N. Y. Agr. exper. station rept. 1885, p. 258). The only experimental work attempted here grew out of the

interesting suggestion of the use of yeast as an insecticide, made by Dr. Hagen in 1879, — a suggestion based on the doctrine of Bail (1861) that *Empusa*, *Mucor*, and *Saccharomyces*, (the fly fungus, the common moulds, and the yeast plant), were merely different forms of the same species and mutually interchangeable. The practical test of this theory, as made by Riley, Prentiss, Smith, Cook, Willet, and others, failed to justify the method (although the results seem not to have been critically studied with the microscope), and its theoretical foundation has completely vanished, — so high an authority as De Bary referring to it in 1884 as an "item in the history of error" (Morph. und biol. der pilze, p. 172).

And finally we come to schizomycosis, the most interesting, probably the most important, far the most intricate and difficult, and consequently the least understood of the forms of insect disease,—perhaps, also, the one which, when fully investigated, will throw most light on problems of human pathology. It has only been possible within a very few years to study the bacterial diseases of insects satisfactorily, since the research has had to wait for the development of methods of bacterial research in general,— a development which did not really reach a stage of advancement sufficient to yield results that could stand the tests of time and repeated experiment until we had the homogeneous immersion objective and the methods of bacterial culture in solid media. A few conclusions have, however, now been made clear,— chiefly, so far as this particular division of our subject is concerned, by Pasteur and his followers in France.

It was in 1867 that *flacherie* or *morts flat* of the silkworm was first discriminated by Pasteur as a distinct contagious bacterial disease, capable of transmission to healthy larvae by infection of their food either with fresh excrement, or with the dust of infected silkworm nurseries of the year before. His personal researches were summed up in his classical work in two volumes (1870) *Études sur les maladies des vers à soie*, and these were followed by numerous other papers — those of Dr. de Ferry de la Bellone in *Actes et mémoires du Congrès sériciсole international* for 1875 and *Comptesrendus sténographiques* of the same congress for 1878, being the ablest and most convincing that have come under my observation. No student of this affection, whose work I have seen, has made a critical botanical study of the species of bacteria involved, but these have been referred to only in general terms which serve to indicate that they include both bacilli and micrococci.

Another more recent and unusually successful research is reported by Cheshire and Cheyne in the *Journal of the Royal microscopical society of London* (v. 5, p. 585), on the disease of bee larvae known as foul brood,—demonstrated by them to be due to an intestinal *Bacillus*.

In America more has been done on these schizomycoses than on any other insect diseases,—chiefly, so far as systematic investigation goes, at the Illinois state laboratory of natural history. Here we have carefully studied jaundice of the silkworm and *flacherie* of

Pieris rapae and of *Datana ministra*, repeatedly isolating the bacterial species in pure cultures, fluid and solid, on gelatine films, and in tubes of agar-agar, drawing, photographing, and mounting many slides to illustrate every step of each experiment and finally testing our results, in every case, by applying the supposed disease germs to the food of healthy insects kept in strict comparison with check lots not so treated. By these methods we have clearly discriminated the species of micrococci characteristic of these diseases, as they have occurred with us, and have shown that the spontaneous *flacherie* of some of our common caterpillars may be unquestionably conveyed to other lepidopterous species and even to the white grubs.

All the bacterial diseases of insects thus far carefully studied, take first and principal effect on the epithelial layer of the alimentary canal,—no distinctively blood disease having yet been distinguished, if we except a supposed "*flacherie*" of *Cleonus* larvae reported by Metschnikoff in Russia, but apparently not critically investigated. These alimentary schizomycoses are extremely common affections, attacking native insects in the open air under all ordinary conditions, and are especially liable to appear among larvae in confinement. I have seen wide-spead epidemics of *flacherie* in the caterpillars of *Pieris rapae*, of *Pyrameis cardui*, and of *Nephelodes violans*, and have met it here and there in numbers of other larvae, both lepidopterous and hymenopterous.

For purposes of practical experiment these bacterial diseases have the great disadvantage that they require for the cultivation of their germs, a considerable degree of experimental skill and scientific training. They consequently promise less immediate and satisfactory results than the muscardines.

In conclusion, gentlemen, I think that you will see why, in trying to present this subject to you, I have not followed a common custom by limiting myself to a summary of the results of the most recent researches;—it was because so little is generally known to our entomologists on this topic, that almost nothing entomological has been done. You can hardly have failed to notice that most of what we know, has been acquired by the economists, like Pasteur, or the botanists, like De Bary and Tulasne—either by those generally indifferent to all but the practical end in view, or else by those using the insect organism only as a culture apparatus for the study of the life histories of fungi. But surely the entomological side of the relation is equally interesting and important—with its unsolved questions of physiology and pathology, its bearings on distribution as influenced by meteorological conditions, its promised contributions to a knowledge of the details of the struggle for existence, and of the general system of interactions obtaining among organic beings.

In the strict specialization of modern scientific work, are we not likely to drop many important subjects as between two stools? May we not safely recognize a group of specialties which shall comprise the study of the biological relations of living things, and give to results gathered from this field as cordial and intelligent a reception as to those of the embryologist or the comparative anatomist?

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EDITORIAL NOTE.

Unavoidable hindrances have so delayed the issue of volume four of PSYCHE that its publishers deemed it best to begin volume five with the year 1888, omitting the years 1886 and 1887. Volume five will include the years 1888 to 1890. The concluding portion of volume four is now partly printed, but will still require considerable time for completion, on account of the expensive index which will accompany it.

NOTE ON PELECINUS POLYCERATOR.

In examining a considerable collection of *Pelecinus polycerator* I noticed that every specimen had the enlarged first segment of the abdomen split longitudinally on the back, on or near the median line. The split is sometimes a mere crack, sometimes a wide gap, and in the latter case is often somewhat torn at the ends.

This splitting has often been noticed by others, but I know of no published account of it. It has been suggested that it had some relation to the remarkable scarcity of the male in this species, but the more probable explanation seems to be in the warping caused in drying. Every collector knows how the parts of the ovipositor of the long-tailed ichneumon-flies (*Pimpla*) warp in drying, and I have never noticed a crack in this place in the living *P. polycerator*, altho I have collected a great number of them.

C: W: Woodworth.

FEEDING HABITS OF A LYCAENID CATERPILLAR.

Last spring Mr. Lintner kindly guided me to his happy hunting grounds at Centre, near Albany, N. Y., where for the first time I had the pleasure of making the personal acquaintance of my namesake, *Rusticus scudderii*. I succeeded in obtaining from females enclosed on lupines a large number of eggs and in rearing many caterpillars to maturity.

The caterpillar has a very extensile head and flexible neck, as figured for *L. pseudargiolus* by Mr. W. H. Edwards, and its manner of feeding immediately after birth is rather remarkable; it first pierces the lower cuticle of the leaf, making a hole just large enough to introduce its minute head, and then devours all the interior of the leaf as far as it can reach — many times the diameter of the entrance-hole — so that when the caterpillar goes elsewhere, the leaf looks as if marked with a circular blister or pustule, having a central nucleus, the nearly colorless membranes of the leaf being all that is left at the blister, and at the central entrance to it the upper membrane only. The blister is 1.75 mm. in diameter, and the nucleus-like opening to it only about 0.25 mm. in diameter.

In later life the caterpillar feeds on both surfaces, though it still seems to prefer the under, but eats entirely through the cuticle of the surface on which it feeds, and down to the opposite cuticle which it leaves untouched. It retains, also, to some degree, its habit of thrusting its head between the cuticles to get at the juicier parts; and I have seen one bore out the cut end of a stem down to the rind on every side.

Samuel H. Scudder.

EGG-LAYING OF LIMENITIS DISIPPUS.

On 12 July, in Sugar Hill, N. H., I saw a female *Limenitis disippus* flying heavily over a bank by the roadside. This bank was covered with young poplar shoots, and, seeing the butterfly settle on one of these, I followed her, and saw that she laid an egg on the tip of a leaf and then flew away. Picking the leaf, I followed her to the next shoot which she selected, and continued the chase until I had collected seventeen eggs. Then the butterfly rose higher in the air, flew to an ash-tree, and was hidden in the leaves. A shower was near, and rain began to fall in less than five minutes after she disappeared.

The eggs all hatched in due time, and produced eleven males and six females, all perfect.

One peculiarity of this female was that she laid more than the "one egg at the very tip," which books and pictures have led us to expect.

One leaf had four eggs; one at the tip, two on one edge near the tip, and one on the other edge near the tip. Another leaf had two; one on the tip, the other near it. The third leaf had three irregularly placed near the tip.

Afterwards I found four eggs, two on each side of the tip of a willow-leaf, but these were not near the same place, and were the only eggs of *L. disippus* that I found on willow. I found no larvae on willow, while they were very abundant on poplar shoots close by. In fact *L. disippus* was more abundant this summer than I have ever found it before.

Caroline G. Soule.

A SPHAERULARIA-LIKE WORM.

In the *American naturalist* for January, 1886 (v. 20, p. 73-75), I called attention to some of the peculiarities of *Sphaerularia bombi*, a nematod parasitic internally in species of bumble-bees (*Bombus*), and to the fact that a species of *Sphaerularia* was found in America. One remarkable peculiarity of *Sphaerularia* is that the genital organs of the female evaginate, and form, when they have attained their full size, a worm-like body. The evaginated ovary is so large in proportion to the worm itself, that the latter was, for a time, overlooked by naturalists, and the evaginated portion was described as a worm.

Professor R. Leuckart, whose researches have done much towards completing our knowledge of the life-history of *Sphaerularia*, has published, in the *Zoologischer anzeiger* (20 Dec. 1886, v. 9, p. 743-746), a preliminary communication entitled, "Ein spaerulariaartiger neuer nematode," in which he gives an account of the structure and habits of a nematod allied to *Sphaerularia*, to which he gives the name of *Asconema gibbosum*. This worm was discovered in the body-cavity of *Cecidomyia pini*, even in the larval state. The worm is about 0.6 mm. long, and the adult female bears, upon the ventral surface near the posterior extremity, a bean-shaped process about 0.25 mm. long. The digestive tract does not form a tube in the adult, but is reduced, as it is in *Sphaerularia*, to a chain of large cells.

The eggs of *Asconema* fall into the body-cavity of their host, the *Cecidomyia*, where they hatch, but the young do not reach their sexual development until they are set free from the host, by the death of the latter. Sexual union takes place within a few days after the *Asconema* are free from their host. After this the males die and the females that get the opportunity pass into the *Cecidomyia* larvae, which inhabit soil composed of decaying pine-needles. Again in the body-cavity of a *Cecidomyia*, the female develops and evaginates its genital organs, while the digestive tract becomes rudimentary. The ovaries of *Asconema* are not so large as those of *Sphaerularia*; while the latter worm requires a year for its development, *Asconema* develops in a few weeks.

G: Dimmock.

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A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard; S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

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Revised edition of the article on this subject in the *Canadian entomologist*, with additions relating to experiments—one of them apparently partially successful. *S. A. F.* (4334)

Peck, C: Horton. Report of the botanist. (31st ann. rept N. Y. state mus. nat. hist., for 1877, 1879), p. 19. (Hedwigia, Oct. 1881, v. 20, p. 154.)

"Seventeen-year locust" (*cicada septendecim*) affected by a fungus. Description of entomophthorous attack. Suggests that it may ordinarily occur on other species of *cicada*. *S. A. F.* (4335)

Saunders, W: Annual address of the president of the Entomological society of Ontario. (Can. entom. Oct. 1879, v. 11), p. 186–187. ([10th] ann. rept. Entom. soc. prov. Ont., 1879), p. 7–8.

Further report of a disease among nearly grown larvae of *clisiocampa sylvatica* in Canada. *S. A. F.* (4336)

Siewers, C: Godfrey. Mold as an insect destroyer. (Amer. nat., Nov. 1879, v. 13, p. 681–683.)

Hagen's theory reiterated. Various instances reported of occurrence of fungous disease among larvae. *S. A. F.* (4337)

1880.

Aitken, J: Notes on a new species of caterpillar fungus. (Hardwicke's science gossip, 1880, p. 97-98.) [not seen.]

On *torrubia* sp. *S. A. F.* (4338)

Hagen, Hermann August. Schädliche insecten durch den hefenpilz zu tödten. (Zool. anzeiger, 19 April 1880, v. 3, p. 185.)

Report of successful experiment with yeast fungus for destruction of *doryphora 10-lineata*, all treated dying in eight to twelve days and a check lot living through the winter. Hagen regards experimental recommendation as independent of theoretical explanation derived from Bail. *S. A. F.* (4339)

Hagen, Hermann August. Ueber die vernichtung schädlicher insecten durch den hefenpilz. (Entom. zeit. . . . zu Stettin, July-Sept. 1880, v. 41, p. 355-357.)

Notice. (Berliner entom. zeitschr., 1881, v. 25, p. 295.)

S. A. F. (4340)

Hagen, Hermann August. On the destruction of obnoxious insects by yeast. (Can entom., May 1880, v. 12, p. 81–83.)

Experiments by Mr. J. H. Burns with yeast plant on *doryphora*. Fifty treated beetles all died by the twelfth day, while only three of the check lot of fifty had died in six weeks, and only twenty-five died during the following winter and spring. Writer mentions also a seemingly successful experiment on aphides. Summarizes some recent European contributions to life histories of *entomophthorae*. Declares experimental results independent of Bail's theory; and reports finding fungus spores in sinus of wings of dead beetles which had been sprinkled with yeast. Successful use of yeast on aphides reported by letter from Germany. *S. A. F.* (434:

Hagen, Hermann August. *Cordyceps ravenelii* on the larvae of *phyllophaga*. (Can. entom., May 1880, v. 12, p. 89.)

Cordyceps ravenelii received from Alabama. Curtis's description quoted. *S. A. F.* (4342)

Leconte, J: Lawrence. Fungoid diseases of insects: a reclamation. (Can. entom., Jul. 1880, v. 12, p. 126–128.)

Comparison of author's own first mention of fungus parasites as insecticides (see Leconte, 1873) with that of Walsh (see 1867). *S. A. F.* (4343)

Packard, Alpheus Spring, jr. [Yeast fungus as an insecticide.] (Amer. nat., Feb. 1880, v. 14, p. 133–134.]

Mere mention. *S. A. F.* (4344)

[**Peck**, C: Horton.] Fungi as insect destroyers. (Amer. nat., May 1880, v. 14, p. 363-364.)

Reprint from Bulletin of Torrey botanical club concerning Peck's observations on *cicada* fungus. *S. A. F.* (4345)

Riley, C: Valentine. The white grub fungus. (Amer. entom., June 1880, v. 3, p. 137–140, fig. 53–55.)

General article, illustrated summary of literature, and list of entomogenous species of *cordyceps*. Quotes Berkeley's description of *cordyceps ravenelii* and gives American bibliography of the genus. *S. A. F.* (4346)

Prentiss, Albert Nelson. Destruction of obnoxious insects by means of fungoid growths. (Amer. nat., 1880, v. 14: Aug., p. 575–581; Sep., p. 630–635.)

Full account of experiments with yeast on aphides, coccids, and red spiders. *S. A. F.* (4347)

Riley, C: Valentine. Yeast ferment: fungus infection. (Bull. no. 3, U. S. Entom. comm, Washington, 1880, p. 68–74.)

Report of experiments with yeast made according to Dr. Hagen's suggestion. Riley quotes at length from Hagen; describes unsuccessful experiments on larvae of *papilio*, *danais*, and *pieris;* and gives a full account of a trial with cotton worms (*aletia*) by Prof. J. E. Willet. Mentions incidentally the occurrence of destructive disease among cabbage worms (*pieris rapae*). *S. A. F.* (4348)

Riley, C: Valentine. Fungus diseases of insects. (Amer. entom., Apr. 1880, v. 3, p. 103.)

Abstract of article by Metschnikoff in *Zoologischer anzeiger*, 1880, p. 44, relating to insect diseases in Europe, and experiments with muscardine fungi. *S. A. F.* (4349)

Riley, C: Valentine. The use of fungus growths to destroy insects. (Amer. entom., Nov. 1880, v. 3, p. 269–270.)

Abstract of article by A. N. Prentiss, in *American naturalist* this year. *S. A. F.* (4350)

Schwarz, Eugene Amandus. Disease of *chauliognathus* larvae. (Amer. entom., Nov. 1880, v. 3, p. 277.)

Note on disease causing larvae to die without subsequent efflorescence of spores. *S. A. F.* (4351)

Seaman, W: H. Some remarks on fungi considered as insecticides. (Amer. entom., Feb. 1880, v. 3, p. 40-41.)

Statement and criticism of Hagen's view of relations of yeast fungi to insect diseases. *S. A. F.* (4352)

Willet, J. E. *and* **Cook**, Albert J: Experiments with yeast ferment on various insects. (Amer. entom., Dec. 1880, v. 3, p. 289–290.)

Experiment on cotton worms (*aletia*) by Willet, with beer and yeast. Larvae treated with beer all lived to the imago; while of those treated with yeast five died either as larvae or pupae. Experiment not regarded as successful. Entirely unsuccessful experiments by Cook with yeast on squash bugs (*anasa*), potato beetles (*doryphora*), cabbage worms (*pieris rapae*), and plant lice (*eriosoma tessellata*). *S. A. F.* (4353)

1881.

Bessey, C: Edwin. Insect destroying fungi. (Amer. nat., Jan. 1881, v. 15, p. 52–53.)

Abstract of article by Giard on life history of *empusa*. Mention of description of *cicada* fungus by C. H. Peck. *S. A. F.* (4354)

Leidy, Joseph. Parasites of the termites. (Journ. Acad. nat. sci. Philad., 1881, s. 2., v. 8, p. 425–447, pl. 51-52.)

Excessive normal parasitism of *protozoa* in termites. *S. A. F.* (4355)

Osborn, Herbert. Occurrence of a bacterial disease in the bronze-colored cut-worm (*nephelodes violans* Guenée). (Iowa homestead, 17 June 1881, v. —, p. —.) (1st ann. rept. N. Y. state entom., Albany, 1882, p. 105.) *S. A. F.* (4356)

Vorce, C. M. Wholesale destruction of acari by a fungus. (Proc. Amer. soc. microscopists, 1881, v. 4, p. 49–50.) (Amer. monthly micros. journ., Sept. 1881, v. 2, p. 166–167.)

Dead mites observed filled with fungus spores. *S. A. F.* (4357)

1882.

Forbes, Stephen Alfred. *Bacterium* a parasite of the chinch bug. (Amer. nat., Oct. 1882, v. 16, p. 824–825.)

Observation of bacteria in alimentary canal of chinch bugs (*blissus leucopterus*) apparently affected by disease. *S. A. F.* (4358)

Forbes, Stephen Alfred. Studies on the chinch bug: 1. (12th rept. State entom. Ill., for 1882, 1883), p. 47–57.

Account of apparent disease among chinch bugs (*blissus leucopterus*) characterized by intestinal *micrococcus* described by T: J. Burrill as *micrococcus insectorum*. *S. A. F.* (4359)

Hagen, Hermann August. Experiments with yeast in destroying insects. (Can. entom., Feb. 1882, v. 14, p. 38–39.) ([13th] rept. Entom. soc. Ontario, 1882, p. 29–30.)

Publishes, with comments, letter from horticulturist giving result of experiments with yeast fungus,—one apparently successful, others without effect. Reports similar variable results from Germany.
S. A. F. (4360)

[**Hagen**, Hermann August. On the destruction of insect pests by the application of yeast.] (Amer. monthly micros. Journ., Sept. 1882, v. 3, p. 179.)

Brief mention of Hagen's views. *S. A. F.* (4361)

1883.

Bessey, C: Edwin. A new species of insect-destroying fungus. (Amer. nat., Dec. 1883, v. 17, p. 1280–1281, 1286.) Bull. Iowa agric. coll.; Dept. entom., 1884, No. 2, p. 84–85.)

Description of *entomophthora calopteni* n. sp.
S. A. F. (4362)

Bessey, C: Edwin. [*Entomophthora calopteni* parasitic on *caloptenus differentialis*.] (Scientific and literary gossip, 15 Dec. 1883, v. 2, p. 40.) *S. A. F.* (4363)

Burrill, T: Jonathan. New species of *micrococcus* (*bacteria*). (Amer. nat., March 1883, v. 17, p. 319–320.)

Original description of *micrococcus insectorum* from chinch bug (*blissus leucopterus*). *S. A. F.* (4364)

Cook, Albert J: The bee-keepers' guide, or Manual of the apiary. 9th ed. 1883, p. 309, 310.

Remarks on foul brood of bees. *S. A. F.* (4365)

Forbes, Stephen Alfred. Experiments with diseased caterpillars. (Science, 5 Oct. 1883, v. 2. p. 483–484.)

Preliminary note on bacterial disease of native caterpillars. *S. A. F.* (4366)

Forbes, Stephen Alfred. A new insect disease. (Prairie farmer, 6 Oct. 1883, v. —, p. —.)

Flacherie of *pieris rapae*. *S. A. F.* (4367)

Forbes, Stephen Alfred. Memoranda with regard to the contagious diseases of caterpillars and the possibility of using the virus of the same for economic purposes. (Amer. nat., Nov. 1883. v. 17, p. 1169–1170.) (Can. entom., Sep. 1883, v. 15, p. 171–172.)

Abstract of article read at Minneapolis meeting of the A. A. A. S. *S. A. F.* (4368)

Forbes, Stephen Alfred. On a contagious disease of caterpillars. (Trans. Ill. hort. soc., 1883, p. 29.)

General article, giving account of results of original observations and experiments. *S. A. F.* (4369)

de La Cour, J. L. *Sporendonema;* or the fungus which is now so prevalent among house-flies. (Amer. monthly micros. journ., Jan. 1883, v, 4, p. 19.)

Rehearsal of general facts concerning *Empusa muscae*. *S. A. F.* (4370)

Osborn, Herbert. An epidemic disease of *caloptenus differentialis*. (Bull. Iowa agric. coll.; Dept. entom., Aug. 1884, no. 2, p. 83–86.) (Amer. nat., Dec. 1883, v. 17, p. 1286–1287.)

Account of entomophthorous disease generally prevalent in central Iowa, affecting *caloptenus differentialis*. *S. A. F.* (4371)

Riley, C: Valentine. [Remark on an epidemic disease of *caloptenus differentialis*.] (Amer. nat., Dec. 1883, v. 17, p. 1287.) (Bull. Iowa agric. coll.; Dept. ent., Aug. 1884, no. 2, p. 85.)

Riley surmises that insects died from insect parasitism, and that *entomophthora* is a later development.
S. A. F. (4372)

Riley, C: Valentine. The cabbage plusia. (Rept. [U. S.] Commiss. agric.. 1883), p. 121.

Fungus disease reported. Parasite described by Farlow as *botrytis rileyi*. *S. A. F.* (4373)

1884.

Burrill, T: Jonathan. Experiments in silk culture. (12th rept. Board of trustees Ill. industrial univ., 1884, p. 85–92.)

Account of contagious disease of silkworm which destroyed all but a few hundred of about 80,000 worms hatched for an experiment in silk culture. General discussion of *flacherie* of silkworm. *S. A. F.* (4374)

Fletcher, James. [Muscardine in *agrotis fennica*.] (Can. entom., Nov. 1884, v. 16, p. 214.) (15th ann. rept. Entom. soc. Ontario, 1885, p. 21.)

Destruction of great numbers of larvae of *agrotis fennica* by an *entomophthora*. *S. A. F.* (4375)

New York microscopical club. [Proceedings] June 6. (Science, 4 Jul. 1884, v. 4, p. 25.)

Account, by J. L. Zabriskie, of a coniomycetous fungus on *drosophila*, a few specimens having been found in the state of New York; and description, by C: H. Peck, of this fungus as a new genus and species (*appendicularia entomophila*) allied to *cordyceps*.
S. A. F. (4376)

Wright, R. Ramsay. [On the corpuscles of *pébrine*.] (Scientific and literary gossip, 15 Jan. 1884, v. 2, p. 70–71.)
S. A. F. (4377)

1885.

Arthur, Joseph C: Disease of clover-leaf weevil: *enthomophthora phytonomi*, Arthur. (4th ann. rept. N. Y. Agric. exper. station for 1885, 1886, p. 241–265, fig. 10.)

p. 258. Illustrated account of an epidemic disease, with description and figures of the *entomophthora* concerned. No resting spores found.
S. A. F. (4378)

Fyles, T: W. [Fungous disease upon the cutworms.] (15th ann. rept. Ent. soc. Ontario 1885, p. 22.)

Mention of occurrence of insect disease in England.
S. A. F. (4379)

Lintner, Joseph Albert. [The seventeen-year locust] destroyed by a fungus. (2d ann. rept. N. Y. State entom., Albany, 1885, p. 178–179.)

Quotation from Peck, 1879: in 31st ann. rept. on New York State museum of natural history.
S. A. F. (4380)

Saunders, W: On some of nature's methods of subduing injurious insects. (Trans. Amer. hort. soc., 1885, v. 3, p. 178.)

Mention of fungus disease of *chisiocampa sylvatica* and *agrotis fennica*. *S. A. F.* (4381)

Saunders, W: Annual address of the president of the Entomological society of Ontario. (Can. entom., Dec. 1885, v. 17,) p. 237–239.

Remarks on the general subject of insect diseases with notes of recent work done. *S. A. F.* (4382)

Woodworth, C: W: Silkworm notes. Silkworm diseases. (Ill. crop prospects, Crop rept., No. 125, 1885, p. 25-26.)

Description of jaundice of silk-worm as occurring in experiment at University of Illinois. *S. A. F.* (4383)

Zabriskie, Jeremiah Lott. A caterpillar fungus from New Zealand, and some related species of the United States. (Journ. N. Y. micros. soc., Apr. 1885, v. 1, p. 89-94, fig. 1–6.)

Cordyceps on caterpillars, white grubs, and a *lecanium*. *S. A. F.* (4384)

1886.

Forbes, Stephen Alfred. [Flacherie in *pieris rapae*.] ILLINOIS—*State entomologist*. Miscellaneous essay's on economic entomology, Springfield, Ill., 1886, p. 5–9.)

Elaborate description of the symptoms, anatomical and histological characters of the disease.
S. A. F. (4385)

Forbes, Stephen Alfred. Studies on the contagious diseases of insects. (Bull. Ill. State lab. nat. his., 1886, v. 2, p. 257–321, 1 pl.)

An elaborate article giving results of observations and author's experimental studies on bacterial disease of *pieris rapae*, *datana* larvae, *mamestra picta*, and silk worm, with brief account of epidemic of muscardine in *clisiocampa sylvatica*. Illustrated by photographs of *micrococcus* of cabbage worm. *S. A. F.* (4386)

An additional list of titles referring to American literature of insect diseases will be given in a subsequent numero.

Alexandre, A. P. Du développement de la forficale auriculaire. D'après les notes de M. Lorenzo Camerano. (Bull. Soc. linn. du nord de la France, 1880, v. 5, p. 55-60.)

Discusses the time of oviposition and the form of the eggs of *forficula auricularia*, the care of the eggs by the adult, the hatching and molting of *forficula* larvae, and the food of *forficula*. *G: D.* (4387)

Belon, Marie Joseph. Histoire naturelle des coléoptères de France. Famille des lathridiens. 2me partie. (Ann. Soc. linn. de Lyon, 1884, 1885, n. s., v. 31, p. 61-212.)

Synopsis of the genera and species of *lathridiidae* of France, with extended descriptions of the species, notes on their synonymy and habitats; the following North American species are included: *corticaria grossa* Lec. [=*c. pubescens* Hummel], *c. fulva* (? N. A.), *c. serrata*, *c. elongata*, *c. deleta* Mann. [=*c. fenestralis* Linn.], *c. pumila* Lec. [= *melanophthalma distinguenda* Comolli]. *G: D.* (4388)

Bigot, J. M. F. [Description d'un nouveau genre et d'une nouvelle espèce de diptères.] (Ann. Soc. entom. France, 1884, s. 6, v. 4; Bull. entom., p. 37.)

Describes *cholomyia inaeguipes*, a new genus and species of *dexidae* from Mexico. *G: D.* (4389)

Bigot, J. M. F. Diptères nouveaux ou peu connus. 24e partie. 32. Syrphidi, 2e partie. Espèces nouvelles, no. 3. (Ann. Soc. entom. France, 1884, s. 6, v. 4, p. 73–116.)

Describes new species of *syrphidae*, as follows: 1 species each of *ischyrosyrphus* and *platycheirus* (from Cal.), 17 species of *melanostoma* (3 from Mexico, 5 from Cal.), 17 of *syrphus* (1 from Mt. Hood, Oreg., 1 from Cal., 2 from Mexico), 10 of *sphaerophoria* (2 from Cal., 5 from Mexico), 15 of *mesograpta* (10 from Mexico, 2 from Cuba), and 1 of *ocyptamus* (from New Caledonia.
G: D. (4390)

Bigot, J. M. F. [Un nouveau genre de diptères.] (Ann. Soc. entom., France, 1884, s. 6, v. 4; Bull. entom., p. 69–70.)

Describes *ancylogaster armatus*, a new genus and species of *tachinidae* from Mexico. *G: D.* (4391)

Bonhoure, Alphonse. Note sur le *platypsyllus castoris* Ritsema et sa capture en France. (Ann. Soc. entom. France, 1884, s. 6, v. 4, p. 147–154, pl. 6.)

Literature of *platypsyllus;* description of *p. castoris* with special reference to its mouth-parts; affinities of the *platypsyllidae* among the coleoptera; notes the discovery of *platypsyllus castoris* on *castor fiber* in France. *G: D.* (4392)

DE Bruyne, C. De kerfdieren. Insecta of hexapoda. (Natura, maandsch. voor natuurwetensch., 15 Dec. 1885, v. 3, p. 289–306, pl. 7–8.)

General outline of the anatomy of insects, with figures to illustrate the chief points. *G: D.* (4393)

Carpentier, Léon. Chasse d'hiver dans les fourmilières. (Bull. Soc. linn. du nord de la France, 1881, v. 5, p. 212–214.)

Notes on myrmecophilous insects, and on the mode of capturing them in winter. *G: D.* (4394)

Chambers, Vactor Tousey. On the antennae and trophi of lepidopterous larvae. (Journ. Cincinnati soc. nat. hist., April 1882, v. 5, p. 5–21, pl. a–c.)

General considerations upon the anatomy and morphology of the mouth-parts of lepidopterous larvae, based, for the most part, on studies of the mouth-parts of *tineina;* 76 figures are given on the plates, illustrating the various mouth-organs of the larvae of lepidoptera. *G: D.* (4395)

Chambers, Vactor Tousey. Descriptions of some new *tineina*, with notes on a few old species. (Journ. Cincinnati soc. nat. hist., Jan. 1880, v. 2, p. 179-194.)

Separate, with same title. [Cincinnati, 1880.] n. t.-p., 26 p., 23 × 15, t 17 × 10.5; 58 fig.

Describes 3 new genera, *pluteloptera*, *aetia*, and *eulyonetia*, and new species belonging to these and to the genera *anesychia*, *hyponomeuta*, *gelechia*, *anarsia*, *laverna*, *aeaea*, *elachista*, *lithocolletis* and *nepticula;* notes on other species of *tineina*. [The separate contains this article, p. 1–16, and author's "Illustrations of the neuration of the wings of American *tineina*" (*op. cit.*, p. 194–204) [Rec., 4397], p. 16–26, the figures pertaining to the latter article.] *G: D.* (4396)

Chambers, Vactor Tousey. Illustrations of the neuration of the wings of American *tineina*. (Journ. Cincinnati soc. nat. hist., Jan. 1880, v. 2, p. 194–204.)

Separate. (CHAMBERS, V. T. Descriptions of some new *tineina* . . . [Cincinnati, 1880], p. 16–26, fig 1–58.)

Illustrates the neuration of the wings in 58 species of North American *tineina*, with remarks on the same subject. *G: D.* (4397)

Chivot-Naudé, A. Notes histologiques. (Bull. Soc. linn. du nord de la France, 1881, v. 5, p. 201–204.)

Includes a description of the eggs of *tipula*, and notes on the structure of the pupal envelope of *tipula*. *G: D.* (4398)

Cook, Albert J: Bee-hives and bee-habits. (Science, 5 Feb. 1886, v. 7, p. 127-128, 51 cm.)

Consideration of usefulness of devices for inverting the comb in bee-hives; notes on the mode of oviposition of *apis mellifica* and the relative amount of intelligence and of instinct governing the queen in regulating the sexes of her progeny. *G: D.* (4399)

Cosson, C: Moeurs des fourmis. (Feuille des jeunes naturalistes, Sept. 1883, v. 13, p. 139.)

Notes on various habits of *formicidae*, as dependant on their olfactory sense, and on their means of communication. *G: D.* (4400)

von Dalla Torre K: W. Zur biologie von *bombus gerstaeckeri* Mor.: *b. opulentus* Gerst. (Zool. anzeiger, 7 Dec. 1885, v. 8, p. 691–693.)

The females of *bombus gerstaeckeri* found, without exception, gathering pollen from *aconitum lycoctonum* (= *a. ranunculifolium*), while the males and workers gathered pollen, without exception, from *aconitum napellus* and *a. paniculatum;* for this peculiar relationship of the food to the sexes the author proposes the name of heterotrophy; in the case of *b. gerstaeckeri*, as an adaptation to the species of plant visited, the remarkable length (21–23 mm.) of the mouth-parts of the females and the shortness (8–12 mm.) of the mouth-parts of the males are noticed. *G: D.* (4401)

Dubois, Michel. Notes sur les insectes habitant les prés salés. (Bull. Soc. linn. du nord de la France, 1880, v. 5, p. 7–9.)

Notes the analogy between the insects of salt marshes and salt lakes and those found on the seacoast. *G: D.* (4402)

Dury, C: Coleoptera of the vicinity of Cincinnati. (Journ. Cincinnati soc. nat. hist., Dec. 1882, v. 5, p. 218–220.)

An addition to the author's "List of the coleoptera observed in the vicinity of Cincinnati" (Journ. Cincinnati soc. nat. hist. Oct. 1879, v. 2, p. 162–178) [Rec., 4404]. The present list enumerates 167 species, making, with the other list, a total of 1586 species. *G: D.* (4403)

Dury, C: List of the coleoptera observed in the vicinity of Cincinnati. (Journ. Cincinnati soc. nat. hist., Oct. 1879, v. 2, p. 162–178.)

Separate. 17 p. 23 × 16, t 17 × 10.5.

List of 1419 species of coleoptera that have been taken in or around Cincinnati, Ohio. To the list are appended some notes on the habits of a few of the species. *G: D.* (4404)

Föttinger, Alexander. Sur les terminaisons des nerfs dans les muscles des insectes. (Arch. de biol., 1880, v. 1, p. 279–304, pl. 10.)

Researches made upon the structure of the nerve-terminations in the muscles of insects—the so-called cones of Doyère—showing that these organs have a transverse striation, as if the muscular disks extended into the termination of the nerve; that the nervous contraction always begins at these cones; and that in the terminal cone the cylinder-axis divides into fibrillae which go to the intermediate disks. *G: D.* (4405)

Göldi, Emil A. Aphorismen, neue resultate und conjecturen zur frage nach den fortpflanzungs-verhältnissen der phytophtiren enthaltend. (Mittheil. Schweiz. entom. gesells., Apr. 1885, v. 7, p. 158–166.)

Finds that certain species of *aphididae*, when kept hungry, produced the winged form even as early in the season as June; compares this hastened development with the hastened pupation of lepidopterous larvae when kept hungry, and thus regards the winged *aphididae* as representing the highest development of the insect (a view held by Claus and Leuckart), and not as larvae (as Lichtenstein regards them); notes upon the significance of the absence of the *vesiculae directrices* in arthropoda and rotifera, upon the mouth-parts of *phytophthires*, and upon a peculiar sense-organ of the fifth and sixth segments of the antennae of *schizoneura lanigera*. *G: D.* (4406)

Goossens, Théodore. Les oeufs des lepidoptères. (Ann. Soc. entom. France, 1884, s. 6. v. 4, p. 129–146, pl. 5.)

A general discussion of the eggs of lepidoptera, illustrated by European species for the most part; the author treats of their form, color, polished and dead surface, their fecundity, the duration of incubation and the effect of temperature upon it, the mode of protection of eggs by the parent, and parthenogenesis, and attempts to classify the eggs of certain groups of lepidoptera by their character. The plate contains colored figures of the eggs of 42 species of lepidoptera. *G: D.* (4407)

Graber, Vitus. Vergleichende grundversuche über die wirkung und die aufnahmestellen chemischer reize bei den tieren. (Biol. centralblatt, 1 Sept. 1885, v. 5, p. 385–398.)

Notice. (Entom. nachrichten., Dec. 1886, v. 12, p. 365.)

Crit. rev., by F. A. J. Plateau, entitled, "Une expérience sur la fonction des antennes chez la blatte, *periplaneta orientalis*" (Compte-rend. Soc. entom. Belg., 5 June 1886, p. 118–122).

The author concludes, from a series of experiments here detailed, upon the action of odors in general and upon special organs, that "an absolute sensitive olfactory organ is not present in certain insects, since one set of organs (the antennae) is most sensitive to one odorous material, while another set of organs (the palpi) is most sensitive to another odorous material." *G: D.* (4408)

Holmberg, Eduardo Ladislao. Observations à propos du sous-ordre des araignées territelaires (*territelariae*) spécialement du genre nord-américain *catadysas*. Hentz et de la nouvelle famille *mecicobothrioidae*, Holmb. (Bol. Acad. nac. de ciencias en Córdoba, 1882, v. 4, p. 153–174, pl. 1.)

Notice, by F. A. F. Karsch. (Zool. jahresb. für 1883, 1884, abth. 2, p. 62, 76–78.)

Gives reasons for regarding *catadysas* Hentz as a drassid and a synonym of *zora* Koch and consequently suppresses the sub-family *cataduysoides;* erects the new family *t[h]eraphosidae;* erects the new genus *territelarium* and describes and figures *mecicobothrium thorellii*, a new genus and species from the Argentine Republic, for which two genera the author establishes the family *mecicobothrioidae*. *G: D.* (4409)

Jung, ——. [Das wiederaufleben eingetrockneter tardigraden.] (Zeitschr. f. d. gesammt. naturw., 1881, v. 54, s. 3, v. 6, p. 190–192.)

Abstract by R. Vion, entitled "Résurrection des tardigrades par l'humidité." (Bull. Soc. linn. du nord de la France, 1882, v. 6, p. 27–28.)

A species of *milnesium*, after being dried five hours, was restored to full vitality upon the application of moisture. *G: D.* (4410)

Keferstein, [Georg] Adolf. Die schmetterlinge Californiens. (Zeitschr. f. d. gesammt. naturwissensch., 1874, v. 44, p. 222–229.)

Notes on *bombycidae* and *rhopalocera* of California, giving food-plants of some species, based on observations made by Dr. H. Behr. *G: D.* (4411)

Keferstein, [Georg] Adolf. Ueber die tagschmetterlings-gattung. *colias* F. (Verhandl K.-k. zool.-bot. gesells. in Wien, 1882, v. 32; Abh., p. 449–458.)

Arranges the species of *colias* in four groups, and gives their synonymy and varieties. *G: D.* (4412)

Langdon, Frank W. Entomology. (Journ. Cincinnati soc. nat. hist., Dec. 1881, v. 4, p. 345–346.)

Notes on *callosamia promethea* and on *botys langdonalis*. *G: D.* (4413)

Langdon, Frank W. Ornithology. (Journ. Cincinnati soc. nat. hist., July 1882, v. 5, p. 95–96.)

Records having taken a *rallus elegans*, which "had sticking in its oesophagus a large water beetle (*hydrophilus triangularis*), the sharp spine on the ventral surface of the beetle having penetrated the wall of the viscus." *G: D.* (4414)

Langdon, Frank W. A synopsis of the Cincinnati fauna. (Journ. Cincinnati soc. nat. hist., Oct. 1882, v. 5, p. 185–191.)

Gives the number of described species of animals known to the fauna of the vicinity of Cincinnati, including the insects, arachnida, and myriopoda *G: D.* (4415)

Lefèvre, Édouard. [Rectifications concernant la famille des eumolpides.] (Ann. Soc. entom. France 1884, s. 6, v. 4; Bull. entom., p. 45–46.)

Synonymy of some genera and species of *eumolpidae;* among others the following notes refer to species or genera found in North America: *chalcoparia* Crotch = *chrysodina* Baly, and *noda convexa* Say and *n. pilula* Germ. = *n. tristis* Oliv. *G: D.* (4416)

Lucas, [Pierre] Hippolyte. [Note relative à une aranéide.] (Bull. d. séances, Soc. entom. d. France, 1884, no. 22, p. 142-143.)

Notes upon *cyrtocarenum* (*cteniza*) *californicum*, its habits and nests as observed in confinement. *G: D.* (4417)

ENTOMOLOGICAL ITEMS.

Rovartani lapok, the Hungarian entomological journal edited by Dr. Géza Horváth, and published at Budapest, ceased to appear with the numero for December 1885, after two years of existence.

Prof. Lewis R. Gibbes, of Charleston, S. C., reports receiving a specimen of *Heliconia charithonia* from Beaufort, N. C., in 1885. This is the northernmost point at which it has been found. It is rare at Wilmington Island, near Savannah, Georgia, according to Dr. A. Oemler. It is more common at St. Simons Island and Port Royal, S. C., but it is not a common butterfly north of Florida.

Preservation of living colonies of Termes lucifugus.—Dr. G. Horváth, in an article in the numero of *Rovartani lapok* for October, 1885, on the discovery of *Termes lucifugus* in Hungary, states that Lespès, who studied very carefully the anatomy of these insects, was unable to keep living colonies for two months. Horváth, on the other hand, has succeeded in keeping colonies alive for two years, by taking pains to sprinkle the nests each day with a few drops of water.

Entomology in geography and literature.—Among late contributions to the connection of literature and entomology are two short papers in *Rovartani lapok* for September and October 1885, respectively. The first is a paper by Géza Horváth on the part which the Hungarian names of insects have played in giving names to towns, villages, and farms in Hungary. There are more than a hundred such names. The second is a paper, by Béla Chyzer, "On *coccinellidae* in the infantile poetry of Hungary," in which eight examples are given of children's verses in which the lady-bugs are mentioned.

Chemically-produced varieties of coleoptera. — Mr. Albert Bergé states (Compt-rendu Soc. entom. Belg., for Nov. 1885), that he has been able to produce all the numerous color-varieties of *Carabus auronitens* by chemical means. He does not enter into details of his processes, as he states that he is intending to prepare a more extensive work on the subject, including in it all the coleoptera; but he makes the general statement that alkalies and acids produce colors varying from brown through red to yellow, and that calcic chloride and heat produce all the tints from green to violet. Mr. Bergé does not claim that these varieties are caused in nature in the same way in which he has produced them.

Prof. K. Lindeman, in an article entitled, "Die am getreide lebenden thrips-arten Mittelrusslands" (Bull. Soc. impér. natur. Mosc., 1886, v. 62, p. 296-337) gives an extended illustrated account of the life-history of *thrips secalina* and *phloeothrips frumentaria*, which do extensive injury to grain in Russia, and adds notes on *thrips antennata*, *t. rufa*, and *phloeothrips armata*, which also live on grain. Injury is caused to grain in two ways by thrips. First the larvae, in large numbers, pierce the ear before it has made its appearance, to such an extent that they cause the death of the tip of the ear. When the ears have further developed both larvae and full-grown thrips pierce the young seed-buds, causing death to the blossoms, and, consequently, poorly-filled heads.

Swarming of aphides at Peterborough, England. — *The entomologist* (Oct. 1885, v. 18, p. 267-268) quotes the following from the *Stamford and Rutland guardian* for 14 August, 1885: — Abundance of aphides at Peterborough. — On Thursday, the central streets of the town were rendered impassible with any amount of comfort, owing to the air being thickly laden with myriads of green flies, in some parts almost resembling a mist. The town air seemed in the long-run to upset them, for they were late in the day to be seen covering the ground to nearly an inch in depth. The Corn Exchange had just been re-painted, and acted as an admirable fly-

catcher, causing some amount of amusement to all except the contractor, who was compelled to pumice-stone their corpses off to make the place presentable.

FUNGI PARASITIC ON INSECTS.—The *Journal of mycology* for March 1886 contains a brief sketch of the life of Lewis David von Schweinitz, based on a sketch read before the Academy of natural sciences of Philadelphia, 12 May 1835, by R. Walter Johnson. Schweinitz was a Pennsylvanian botanist, who was born in 1780 and died in 1834. Amongst other systematic work on cryptogams he published descriptions of the fungi parasitic on insects, his being the first described species of these fungi from America. The same numero of the *Journal* contains the beginning of a "Synopsis of the North American *hypocreaceae*, with descriptions of the species," by J. B. Ellis and B. M. Everhart. This family of fungi includes the genus *Cordyceps*, some of the species of which are parasitic on insects, causing the phenomena known as "vegetating larvae."

INSECTS AS AUTHORS OF EPIDEMICS.—Dr. R. L. Maddox, in a paper read before the Royal microscopical society, details the results of further experiments in feeding insects, especially the common blow-fly, on the comma bacillus. His observations include a large number of microscopical determinations. The results of all his investigations lead him to believe that the comma bacillus from cultures can pass in a living state through the digestive tubes of some insects, and, through this fact, that such insects are likely to become an important means of distributing disease, especially to animals that feed upon them. This is in accordance with the views of Dr. Grossi, that "insects, especially flies, may be considered as veritable authors of epidemics and agents in infectious maladies." — *Sci. american*, 18 Dec., 1886.

MIGRATION OF INSECTS. — A proposition has been made in Celyon for the systematic observation of the singular migration of butterflies in that island. Despite occasional references in the local press, nothing has yet been done towards compiling and editing a scientific and comprehensive record of annual observations. It is proposed, therefore, that volunteers should watch for the migration, and send a post-card bulletin to the editor of records, noticing date, direction of flight, direction of wind, the weather, and the species. For the last purpose, amateur observers are to send one specimen of each species noticed, in order to ensure scientific accuracy. A competent naturalist is stated to have offered to revise, assort, and edit all such notices once or twice a year, and publish a periodical report of progress. The annual summary will appear in the 'Taprobanian magazine.' — *Entomologist*, May 1886, v. 19 p. 140.

ANOTHER NUISANCE. — A copy of *The insect world*, a popular paper published by its editor, Noble M. Eberhart, at Chicago Lawn, Ill., has come to our notice. Like a number of journals purporting to deal popularly with scientific subjects, this one abounds with typographical errors and careless statements, but, as if to atone for other shortcomings, it has departments devoted to geology and mineralogy, ornithology, and archaeology. The journal is a monthly, of inconvenient form (31×22 cm.), and fills no want in scientific literature. The following quotation from a paper by the editor, entitled, "Among the insects" will sufficiently show the scientific and literary value of this new entomological journal.

"FORFICULIDAE.—This family contains the Earwigs. Common superstition is that they enter the human ears; but this is absurd, as the excretions of the ear would kill the insect."

How long since was the ear discovered to be an *excretory* organ? *G: D.*

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CONTENTS:

ADVERTISEMENTS 26
MIMICRY IN HEMIPTERA — *Edward P. Van Duzee* 27–28
VARIABLE NUMBER OF MOLTS IN INSECTS — *Anna Katherina Dimmock* . . . 28–29
CURIOUS PUPA OF PIERIS — *Charles William Woodworth* 30
PARASITES STINGING PUPAE OF PIERIS RAPAE — *Caroline G. Soule* 30
EGG-LAYING OF LIMINITIS DISSIPPUS — *Samuel Hubbard Scudder* 30
BIBLIOGRAPHICAL RECORD, no. 4418–4455 31–34
ENTOMOLOGICAL ITEMS 35–36

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INDEX TO ENTOMOLOGICAL LITERATURE.

Having accumulated an immense stock of references to the literature of entomology, I will furnish references on special subjects at ten cents each reference, or fifty cents per decade. For further particulars see PSYCHE for Oct.-Dec. 1884, v. 4, p. 223.

B: PICKMAN MANN,
Washington, D. C.

LIBRARY OF THE CAMBRIDGE ENTOMOLOGICAL CLUB.

The librarian of the Cambridge Entomologica Club calls attention to the desirability of preserving in the library of the Club as complete a series of entomological publications as it is possible to collect. It is especially desirable to preserve the transient literature of the subject—separates, small pamphlets and newspaper articles—and the librarian will be pleased to receive single copies of the daily papers, scientific journals, magazines, or agricultural papers, which contain entomological articles. These papers are preserved and catalogd, and, because they are overlooked by large general libraries, are just the kind of material that should be preserved in a special entomological library. Any one who has sought for some of the best of the agricultural journals of the western states in libraries will appreciate any effort made to preserve journals of this sort.

Separates which are often thrown into the waste-basket, as useless, as too small for preservation, as duplications of parts of serials, or as valueless, are respectfully solicited. The friends of the Club are also asked to send a copy of newspapers in which they have published articles or notes on entomological subjects. If these notes are anonymous, the author's name will be acceptible information.

The accessions to the library of the Club had reached the number of 1643 at the end of last year (1887).

Direct all papers for the library to

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PSYCHE.

MIMICRY IN HEMIPTERA.

E. P. VAN DUZEE, BUFFALO, N. Y.

The family *lygaeidae* presents us with two examples of protective mimicry that seem well worth recording. These cases which are very similar, have doubtless been frequently observed by collectors, but I have seen no published account of them. I refer to the adolescent stages of *Cymus angustatus* and *Oedancala dorsalis;* both live on the various species of *Carex* and *Juncus* growing in swampy places in open woods and pastures.

Cymus angustatus occurs principally on *Juncus nodosus* and allied species, but is frequently found on the smaller *Carices;* it is extremely abundant in the localities mentioned above, and along roadside ditches, and in fact wherever the *Juncus* grows. In this vicinity it appears in May, and continues until late in autumn; copulation takes place about the first of July, the immature insects are abundant through the last of July, the imago appearing from the first to the tenth of August. The young, at least in the nymph state, bear a striking resemblance to the capsules and perigynia of the plants on which they occur; they are of a dull straw-color, ovate in form, compressed or somewhat lenticulate, acute behind, produced and blunt before, and with the connexivum expanded and very thin. When taken in the sweep-net with the glumes and fruit of these plants, it is all but impossible to detect them as long as they remain quiet, which however, fortunately for the collector, is never for any considerable length of time. I have frequently poked them aside with my tweezers, never suspecting their true character until they indicated it by scrambling to their feet and running off, which they did with surprising facility.

Oedancala dorsalis is a larger species and rather less abundant; it occurs wherever *Carex vulpinoidea* can be found, but can frequently be taken on other species of *Carex* and *Cyperus.* In the nymph state it greatly resembles the preceeding, but is larger, more rounded in form, has a conspicuous dark line on the dorsum, and is of a much more sluggish disposition; it is equally difficult to detect, when on the plant or mixed with the contents of the sweep-net. The imago when senile is

deeply suffused with red; in this state they can be found through June and July, when, however, they are less common than at other times: they reach maturity about the tenth of August, but occur throughout the summer from May to September, being the most abundant in August.

I would here mention another hemipteron that affects the same plants, through July and August, the *Liburnia dorsalis* of Fitch, who described it under the Fabrician genus *Delphax*. Like the foregoing species it derives protection by its close resemblance to the inflorescence of its native grasses, being of a soiled yellow or testaceous color with a darker dorsal stripe. It is not a common species here, and is difficult to capture as it is very shy and agile, and when approached leaps so quickly that the eye cannot follow it. I have never taken the young.

VARIABLE NUMBER OF MOLTS OF INSECTS.

BY ANNA KATHERINA DIMMOCK, CAMBRIDGE, MASS.

The first notes given below are translated from a paper by Alfred Wailly, entitled "Educations d'attaciens séricigènes faites à Norbiton, Surrey, Angleterre, en 1884" (Bull. d'insectol. agricole, Nov. 1885, v. 10, p. 173-174).

"In my English article, recently published in the Journal of the Society of arts, of London, I have given certain accounts of the curious system employed by Mr. Weniger in rearing lepidoptera and of the extraordinary results obtained by him. He rears the larvae in a large glass box, a green-house in miniature, heated by a kerosene lamp, upon which is placed a saucer filled with water. The larvae, kept at a uniform temperature of about 25 degrees centigrade, live in an atmosphere charged with the vapors of water and kerosene, and instead of dying of disease, they develop with extraordinary rapidity. I have seen the larvae of *Antheraea mylitta*, hatched seven days after the deposition of the eggs, arriving at their last stage towards the end of a month. *Attacus atlas* was reared in a like manner, and fourteen days after the formation of the cocoons, the emergence of the moths took place; but not a single copulation was obtained. Many delicate species difficult to rear, have been reared in this manner with great success.

"There is also a fact which, I think, here merits attention. The larvae of *Antheraea mylitta* and of *Ceratocampa imperialis*, species considered as having six stages, and which, when reared under normal conditions actually have the six stages, when reared in this

warm, moist atmosphere have but five stages; Mr. Weniger tells me that there was no error on his part as to the number of stages; none were overlooked.

"My correspondent in Ceylon, who has for many years reared *Antheraea mylitta*, likewise asserts in an article published by him in a journal at Colombo, and which I have lately read, that the *mylitta* race which he reared had but five stages; in Ceylon too the climate is warm and moist.

"*Platysamia cecropia* has also six stages, but cannot this likewise have but five, reared under these same conditions? May we not conclude from these facts that certain species of lepidoptera can have many or fewer stages according to the conditions or according to the way in which they are reared? Further observations will be made on this subject which I shall submit to the society."

In connection with this article by Mr. Wailly, it may be well to mention a few more observations on this interesting subject. Dr. C. V. Riley (1st ann. rept. state entom. Mo., 1869, p. 145), observed that the larvae of *Orgyia leucostigma* which produced females had four molts, while those producing males had but three. Mr. J. Hellins (Entom. month. mag., 1881, v. 18, p. 86) noticed, apparently, no sexual difference as regards the number of molts of *Orgyia antiqua*, having reared four larvae which molted as follows: one male molting three, another one four times; one female molting four, another one five times. This is at variance with Dr. Riley's statements above noted. Yet another observer, Mr. N. Coleman (Papilio, 1882, v. 2, p. 165), noticed the fact that a certain larva of *Orgyia leucostigma*, bred at the same time, and under the same conditions as others of its species, molted once more than did any of the others, and that this individual, upon emergence from the cocoon, proved to be a female. The variability of the number of molts of *Orgyia leucostigma* is evidently for the purpose of enabling the female to attain its full size, which is, in that genus, considerably larger than that of the male, but there is possibly a variation in the number of molts that is due to climatic influences, corresponding, therefore, in a way, to the results obtained by Mr. Weniger.

Dr. C. V. Riley disagrees with Mr. Wailly as to the number of molts of *Attacus cecropia*, the former (Amer. entom., Feb., 1870, v. 2, p. 100) recording but five, the latter (Bull. Soc. acclim. France, May 1882, s. 3, v. 9, p. 266-267) six stages. Might not this be due to climatic influences? Mr. W: H: Edwards stated (Psyche, 1881, v. 3, p. 171) that he found upon rearing *Callosamia prométhea* that the larvae molted but three times, while Mr. Lintner (Entom. contributions, no. 3, 1874, p. 126) believes the larva of this species to have four molts. As Mr. Edwards' specimens were reared farther south than were Mr. Lintner's, it would appear that this instance, if due to climatic influence, was as would be expected, i. e., that the larvae reared at the north had more molts than those reared at the south.

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CURIOUS PUPA OF PIERIS.

Some time ago I found a pupa-skin of *Pieris rapae* in the cell of a deserted nest of the common paper-wasp (*Polistes*). It was fastened into the cell by the end, in the usual way, but I cannot be certain about the girdle; if there was any I failed to see it. This is the only instance in which I know of this species seeking such a place of concealment.

C. W. Woodworth.

PARASITES STINGING PUPAE OF PIERIS RAPAE.

In looking over the *American entomologist* for 1880, I came upon the following statement, on page 126,—

"CABBAGE-WORM PARASITE.—We notice that correspondents of the agricultural and horticultural press when referring to the *Pteromalus puparum*, or imported cabbage-worm parasite, generally state that the female fly deposits her eggs in the pupa or chrysalis. This, however, is incorrect, as any one can discover by gathering some of the infested full-grown caterpillars and placing them in a close box to undergo their transformation."

Unless the "Imported cabbage-worm" has more than one parasite this is an incorrect correction! In the summer of 1883 great numbers of *Pieris rapae* laid their eggs on nasturtium (*Tropaeolum*) leaves by the side of our house. I watched the young larvae through all their changes, noted the great number of tiny parasitic flies, and watched the egg-laying of the latter. Many laid their eggs in half-grown or fully grown larvae. Many also punctured larvae which had suspended for pupation, and as many laid their eggs in the very fresh pupae, stinging them usually between the abdominal segments. I saw no parasite sting a pupa which was more than an hour old, but that may have been because it had been stung either as fresh pupa or larva.

Out of forty pupae which I watched, and took down after they were a day old, I got not one imago of *Pieris rapae*, but plenty of small flies. I am not sure of the name of these flies, for I was not interested in the parasites then, and took no pains to identify them.

That pupae are never stung by parasites does not seem to be proved by the fact that parasites will emerge from "infested full-grown caterpillars" which are taken and put in a close box to undergo their transformation." Like so many disputed questions both side are true, I did not know there was any question about it until, in looking for something else, I came upon this statement.

Caroline G. Soule.

EGG-LAYING OF LIMENITIS DISIPPUS.

Miss Soule's note (PSYCHE v. 5, p. 14), interested me very much. Riley records an instance of three eggs laid on a single leaf, but I have never seen so extreme a case, and with hardly an exception have found the eggs laid singly. Is Miss Soule confident that the several eggs on a given leaf were all laid by the same butterfly? Was there any disparity in the time of their hatching? It would be interesting to know what difference there might be. In one instance where I saw two eggs laid within five minutes of each other, one hatched from eighteen to twenty hours after the other.

Samuel H. Scudder.

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard; S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Bergé. Albert. De la coloration des téguments chez les insectes et spécialement chez les coléoptères. 2e note. (Compte-rendu Soc. entom. Belg., 3 Oct. 1885, p. 113–115.)
Separate. 3 p., 25 × 16, t 19 × 10.5.
Correction by the author. (*op. cit.*, 7 Nov. 1885, p. 125.)

Rev. of H. A. Hagen's "On the color and the pattern of insects" (Proc. Amer. acad. arts and sciences, 1882, v. 17, p. 234–267), with further remarks on the coloration of insects, in continuation of the author's "Note sur la coloration des téguments chez les insectes" . . . [Rec. 4419.] *G: D.* (4418)

Bergé, Albert. Note sur la coloration des téguments chez les insectes et spécialement chez les coléoptères. (Compte-rendu Soc. entom. Belg., 5 Sept. 1885, p. 100–102.)
Separate. 3 p., 25 × 16, t 19 × 10.5.

Considers the part taken by the different modes of coloration—pigment, etc.—in the resultant coloration of coleoptera, and the changes which these colors undergo when treated with chemicals. *G: D.* (4419)

Bergé, Albert. Des variétés du *carabus auronitens* Fab., au point de vue de la coloration. (Compte-rendu Soc. entom. Belg., 7 Nov. 1885, p. 126–129.)
Separate. 4 p., 25 × 16, t 19 × 10.5.

The author has succeeded by chemical means in producing all the numerous color-varieties of *carabus auronitens*, and groups these varieties according to their changes of coloration. *G: D.* (4420)

Brauer, Friedrich. Offenes schreiben als antwort auf Herrn Baron Osten-Sacken's "Critical review" meiner arbeit über die notacanthen. Wien *author*, 1883. t.p. cover, 11 p., 23×14.5. t 16.5×10.5.

Answer to C: R. Osten Sacken's "On Professor Brauer's paper: Versuch einer characteristik der gattungen der notacanthen. 1882" (Berl. entom. zeitschr., 1882, v. 26, p. 363-380) [Rec., 4447]. *G: D.* (4421)

Brauer, Friedrich. Die zweiflügler des kaiserlichen museums zu Wien. **2**. (Denksschr. d. Math.-naturw. cl. d. Kais. akad. d. wissensch., 1882, v. 44, p. 59-110, 2 pl.)
Rev. (BERTKAU, P. Bericht . . . der entom. f. 1881, 1882, p. 146-147, 154-155.)
Notice, by F. A. F. Karsch. (Zool. jahresb. für 1882, 1883, abth. 2, p. 337, 344, 350-351, 355-361, 363, 365, 380.)

Contains three sub-chapters as follows:—

1. Versuch einer characteristik der gattungen der notacanthen Ltr., mit rücksicht auf die im kaiserlichen museum befindlichen von Dr. J. R. Schiner aufgestellten neuen gattungen.
Crit. rev., by C: R. Osten Sacken, entitled, "On Professor Brauer's paper: Versuch einer characteristik der gattungen der notacanthen. 1882." (Berl. entom. zeitschr., 1882, v. 26, p. 363-380.)

Characters and relationships of, and table for the generic determination of *notacantha*; description of new or hitherto insufficiently described genera and species, according to Schiner's catalog; includes *myxosargus fasciatus*, n. g. et n. s., from Mexico; résumé of the genera according to the chief groups.

2. Vergleichende untersuchungen des flügelgeäders der dipteren nach Adolph's theorie.

Comparison of the venation of the wings in different families of diptera, according to Adolph's method, including a table comparing the terminology of veins as used by Hagen, by Meigen and by Schiner. The two plates illustrate venation of the wings of diptera.

3. Characteristik der mit *scenopinus* verwandten dipteren-familien.

Consideration of the position of *scenopinus*, which the author puts with *pseudatrichia* in a group, *scenopinidae*. *G: D.* (4422)

Chambers, Vactor Tousey. New species of *tineina*. (Journ. Cincinnati soc. nat. hist., Jan. 1881, v. 3, p. 289-296.)

Separate. [Cincinnati, 1880. t.-p. cover + 8 p., 23 × 15.5, t 16.5 × 10.5, il.

Describes 10 new species of *tineina*, belonging to the genera *gelechia*, *glyphypteryx*, *douglassia*, *laverna*, *elachista*, *gracilaria*, and *oposlega*. *G: D.* (4423)

Dewey, James T. Lepidoptera attracted by electric light. (Entomologist, Jan. 1882, v. 15, p. 21-22.)

List of lepidoptera captured about an electric light. *G: D.* (4424)

Elwes, H: J: Additional notes on the genus *colias*. (Trans. Entom. soc. Lond., 1884, p. 1-26.)

List of the species of *colias*, divided into groups, and with notes on habitat of each species; discussion of the specific characters in the genus, and of the synonymy of several species, including some from North America. *G: D.* (4425)

Emery, Carl. Fortbewegung von tieren an senkrechten und überhängenden glatten flächen. (Biol. centralbl., 15 Sept. 1884, v. 4, p. 438-443.)

A general review of the views held by Dahl, Dewitz, Rombouts, and Simmermacher, as to how insects are able to walk on vertical or overhanging smooth surfaces. *G: D.* (4426)

Engelmann, G: Notes on the genus *yucca*. No. 2. (Trans. Acad. sci. St. Louis, 25 Apr. 1874, v. 3, p. 210-214.)

Corrections and additions to author's "Notes on the genus *yucca*" (*op. cit.*, 15 Apr.-27 June 1873, p. 17-54) [Rec., 2644]; includes statement that *tegeticula yuccasella* oviposits in all the species of *sarcoyucca* as well as in all yuccas with dry pods; place and manner of deposition of eggs of the *tegeticula*; effect of this deposition upon the ovules of the plant. *B: P. M.* (4427)

Faxon, Walter. On the presence of *demodex folliculorum* in the skin of the ox. (Bull. Mus. comp. zool., 1878, v. 5, no. 2, p. 11-16, 1 pl. + 1 p. expl.)

Separate. Cambridge, Mass., May 1878. t.-p. cover, p. 11-16, 1 pl. + 1 p. expl., 25 × 15, t 17 × 10.

Account of the damage done to leather from the ox (*bos*) by the presence in its skin of *demodex folliculorum*; description of this parasite; its external anatomy; history and literature of *d. folliculorum*, and quotation of the treatment recommended by J. B. Simonds for dogs afflicted with these parasites. *G: D.* (4428)

Liénard, Valère. Recherches sur le système nerveux des arthropodes. Constitution de l'anneau œsophagien. (Arch. de biol., 1880, v. 1, p. 380-391, pl. 15.) [Rec. 1747.]

Notice. (Amer. nat., Nov. 1880, v. 14, p. 812.)

Researches on the commissure which connects the two portions of the infraoesophageal ganglion transversely in the arthropoda. *G: D.* (4429)

Lowne, B: Thompson. On the so-called suckers of *dytiscus* and the pulvilli of insects. (Monthly micros. journ., June 1871, v. 5, p. 267-271, pl. 89.)

Considers that *dytiscus* attaches itself with its anterior tarsi by virtue of a secretion from the tarsi, and not because it produces a partial vacuum with the disks of its tarsi; compares this mode of attachment with the like mode of adhesion in other beetles and in flies, where the tarsi are provided with glands which open into the tubular hairs of the pulvilli; figures the anterior foot of *dytiscus marginalis* and its so-called suckers. *G: D.* (4430)

Lucas, [Pierre] Hippolyte. [Note sur le *gibbium scotias*]. (Ann. Soc. entom. France, 1884, s. 6, v. 4; Bull., p. 77-78.)

Note on the breeding of *gibbium scotias* in a box of ground red-pepper (fruit of *capsicum annuum*). *G: D.* (4431)

Ludwig, Friedrich. Ueber das verschwinden gewisser insekten infolge der einwanderung der *puccinia malvacearum* Mont. (Hedwigia, Sept.-Oct. 1885, v. 24, p. 219-220.)

Abstract, by W. A. Kellerman. (Journ. of mycology, Jan. 1886, v. 2, p. 9-10.)

Puccinia malvacearum has caused the extinction of certain species of *malvaceae* in regions where it has been introduced, and consequently has exterminated or caused a change of food-habits of species of insects which feed upon these plants; in a part of South Australia this fungus has nearly caused the extinction of *lavatera plebeja*, and with its disappearance also disappeared the beautiful beetles of the genus *lamprima* that visited the flowers of the latter in myriads. *G: D.* (4432)

McCook, H: Christopher. The honey ants of the Garden of the gods [Colorado]. (Próc. Acad. nat. sci. Philad., 1881, p. 17-77, pl. 1-10.)

Abstract, by R. Vion, entitled, "Les fourmis à miel." (Bull. Soc. linn. du nord de la France, 1882, v. 6, p. 87-90.)

The subjects pertaining to the honey-ant (*myrmecocystus melliger*), of which this paper treats, may be enumerated by quoting, with some alterations, the author's headings, as follows: 1, geographical distribution; 2, nest-sites and exterior architecture of the nests; 3, position of the honey-bearers in the nest; 4, nectar-producing galls the source of the honey-supply, nocturnal habits; 5, quality of the ant-honey, its chemical composition and its uses as food and medicine; 6, interior architecture of the nest, gates, galleries and rooms of different kinds, floors and roof; 7, queen-life, her body-guard, depositing eggs; 8, acts of beneficence, lack of individual beneficence, cleansing and feeding larvae, toilet habits, fraternal relations with sister colonies; 9, economy of the honey-bearers, which are used as storehouses of honey, and which regurgitate the honey for the use of the workers, treatment of dead honey-bearers, effects of withholding food, mode of covering obnoxious matter, food-habits; 10, anatomy of the alimentary canal, the segmental plates of the abdomen and their arrangement to permit distention of the abdomen, the crop or ingluvies, the gizzard or proventriculus, the stomach, malpighian tubes, the intestine, notes on the Australian honey-ant (*camponotus inflatus*); 11, possible organs of stridulation in ants and the sounds which ants produce; 12, destruction of the ants by mites; 13, previous accounts of the honey-ant; 14, description of the species. The plates contain numerous illustrations of the subjects mentioned above. *G: D.* (4433)

McIntire, S. J. An incident in the life of a chelifer. (Monthly micros. journ., Nov., 1871, v. 6, p. 209-210, pl. 102, fig. 3.)

Gives notes on the breeding habits of *chelifer*, and figures a female bearing the egg-case; the food of *chelifer* is incidentally mentioned to be podurans. *G: D.* (4434)

Müller, Fritz. Eine aufgabe für lepidopterologen. (Berl. entom. zeitschr., 1883, v. 27, p. 214-216.)

Separate. [Berl., 1883.] p. 214-216, 22 × 14.5, t 16.5 × 10.

Discusses the bearing of similar characters, and similar food-plants of larvae, on the systematic relationship of certain lepidoptera. *G: D.* (4435)

Müller, Fritz. Sobre as casas construidas pelas larvas de insectos trichopteros da provincia de Santa Catharina [e supplemento]. (Arch. do Museu nacional do Rio de Janeiro, 1878; v. 3, p. 99-134, 210-214, pl. 8-11.)

Abstract, by the author, entitled, "Notes on the cases of some South-Brazilian *trichoptera*." (Trans. Entom. soc. Lond., 1879, p. 131-144.) [Rec., 4441.]

Germ. tr., by Hermann Müller, entitled, "Ueber die von den trichopterenlarven der provinz Santa Catharina verfertigten gehäuse." (Zeitschr. f. wiss. zool,, 1880, v. 35, p. 47-87, pl. 4-5.) [Rec., 2544.]

Abstract, by H. A. Hagen. (Zool. jahresb. für 1880, 1881, abth. 2, p. 218-228.)

Abstract. (BERTKAU, Ph. Bericht . . . der entom. f. 1880, 1882, p. 119-120.)

Biological notes on a large number of Brazilian species of *trichoptera*, with descriptions and figures of their larva-cases. *G: D.* (4436)

Müller, Fritz. A correlação das flores versicolores e dos insectos pronubos. (Arch. do Museu nacional do Rio de Janeiro, 1877, v. 2, p. 19-23.)

Shows how a species of *lantana* secures more certain fertilization by insects because it has flowers of which the corolla is successively of three different colors; observations upon the insects that visited the flowers when they were of each successive color. *G: D.* (4437)

Müller, Fritz. On female dimorphism of *paltostoma torrentium*. (Entom. mo. mag. Mch. 1881, v. 17, p. 225-226.)

Reply to C: R. Osten Sacken's "Dr. F. Müller's discovery of a case of female dimorphism among diptera" (Entom. mo. mag., Nov. 1880, v. 17, p. 130-132) [Rec., 3519]; argues that the forms of *paltostoma torrentium* described belong to one species; remarks on other criticisms. *B: P. M.* (4438)

Müller, Fritz. As maculas sexuaes dos individuos masculinos das especies *danais erippus* e *d. gilippus*. (Arch. do Museu nacional do Rio de Janeiro, 1877, v. 2, p. 25-29, pl. 2.)

Describes and figures the structure of the sexual spots on the hind wings of the male of *danais archippus*, and the tufts which the same insect can protrude from near the posterior end of its abdomen. *G: D.* (4439)

Müller, Fritz. A metamorphose de um insecto diptero. (Arch. do Museu nacional do Rio de Janeiro, 1879, 1881, v. 4, p. 47-85, pl. 4-7.)

Describes and figures the external and internal anatomy of the different stages of *paltostoma torrentium*, a dipteron of the family *blepharoceridae;* the species exhibits a remarkable dimorphism in the female, especially marked in the structure of the mouth-parts of the imago; the larva has six suckers along the median line of its ventral surface, and uses them to fasten itself to the stones in the streams where it lives. *G: D.* (4440)

Müller, Fritz. Notes on the cases of some South Brazillian *trichoptera*. (Trans. Entom. soc. Lond., 1879, p. 131-144.)

Notice. (Amer. nat., Sept. 1880, v. 14, p. 665.)

Numerous notes on the biology of South American *trichoptera*, and the structure of their cases. The full descriptions and figures of the cases mentioned in this paper are published in the author's "Sobre as casas construidas pelas larvas de insectos trichopteros da provincia de Santa Catharina". . . (Arch. do Museu nacional do Rio de Janeiro, 1878, v. 3, p. 99-134, 210-214, pl. 8-11) [Rec., 4436]. *G: D.* (4441)

Müller, Fritz. Os orgãos odoriferos da *antirrhaea archaea* Hübner. (Arch. do Museu nacional do Rio de Janeiro, 1878; v. 3, p. 1-7, pl. 1.)

Describes the odoriferous spots, and the scales which form them, on the wings of *antirrhaea archaea*. *G: D.* (4442)

Müller, Fritz. Os orgãos odoriferos das especies *epicalia acontius*, Lin. e de *myscelia orsis*, Dru. (Arch. do Museu nacional do Rio de Janeiro, 1877, v. 2, p. 31-35, pl. 3.)

Describes the odoriferous spots (filzflecke) on the wings of males of *epicalia acontius* and of *myscelia orsis;* figures the wings, and modified scales from them. *G: D.* (4443)

Müller, Fritz. *Paltostoma torrentium*. Eine mücke mit zwiegestaltigen weibchen. (Kosmos, Oct. 1880, v. 8, p. 37-42, il.)

Crit. rev., by C: R. Osten Sacken, entitled "Dr. F. Müller's discovery of a case of female dimorphism among diptera." (Entom, mo. mag., Nov. 1880, v. 17, p. 130-132.) [Rec. 3519.]

Abstract, by P. Mayer. (Zool. jahresb. für 1880, 1881, abth. 2, p. 119.) Abstract, by F. Karsch. (*op. cit.*, p. 249-250.)

Notice. (BERTKAU, Ph. Bericht . . . der entom., f. 1880, 1882, p. 128.)

Describes and figures the head, mouth-parts, and claws of the two forms of the female of *paltostoma torrentium*, a Brazilian species of *blepharoceridae* exhibiting remarkable dimorphism in that sex, especially in the parts above mentioned. *G: D.* (4444)

Müller, Fritz. A prega costal das hesperideas. (Arch. do Museu nacional do Rio de Janeiro, 1878, v. 3, p. 41-50, pl. 5-6.)

Describes the sexual spots on the costae of the anterior wings of certain *hesperidae*, and the scales which are contained in these spots; these costal spots, which are probably odoriferous organs, are described and figured in *telegonus midas, t. mercatus, hesperia syrichtus, leucochitonea arsalte, thymele simplicius, t. protillus, t. proteus* and *entheus vitreus*.

G: D. (4445)

Osten Sacken, C: Robert. Bemerkungen über blepharoceriden. Ein nachtrag zur "Revision" dieser familie von Professor Dr. Loew. (Deutsch. entom. zeitschr., 1878, v. 22, p. 405-416.)

Notes on the form and size of the eyes of the *blepharoceridae* and the arrangement of the facets upon them; geographical distribution of the species; critical notes on Francis Walker's work on diptera; gives an extended description of *liponeura* (*blepharocera*) *yosemite* from Cal., and compares it with other species; synopsis of the genera of *blepharoceridae;* characters in which the genera agree and differ, arranged according to the organs. [Corrigendum, by author: On p. 406, line 11 from top, after "Hinsicht," insert "ausserhalb der Familie der Cyrtiden."] *G: D.* (4446)

Osten Sacken, C: On Professor Brauer's paper: Versuch einer characteristik der gattungen der notacanthen. 1882." (Berl. entom. zeitschr., 1882, v. 26, p. 363-380.)

Reply, by F. Brauer, entitled "Offenes schreiben als antwort auf Herrn Baron Osten-Sacken's 'critical review' meiner arbeit über die notacanthen. Wien. 1883. t.-p. cover, 11 p., 23×14.5, t 16.5×10.5.

Detailed critical review of F. Brauer's "Versuch einer characteristic [etc.]" in author's "Die zweiflügler des Kaiserlichen museums zu Wien. 2" (Denkschr. d. Kais. akad. d. wissench., Math-naturw. cl., 1882, v. 44, p. 59-110) [Rec., 4422], with numerous additions and notes. *G: D.* (4447)

Plateau, Félix [Auguste Joseph]. Une expérience sur la fonction des antennes chez la blatte, *periplaneta orientalis.* (Compte-rend. Soc. entom. Belg., 5 June 1886. p. 118-122.)

Separate. Gand, 1886, 5 p., 24 × 16, t 19 × 10.5.

Notice. (Entom. nachrichten, Dec. 1886, v. 12, p. 365.)

Critical review of V. Graber's "Vergleichende grundversuche über die wirkung und die aufnahmestellen chemischer reize bei den tieren." (Biol. centralblatt, 1 Sept. 1885, v. 5, p. 385-398) [Rec., 4408], in which Plateau comes to the conclusion that the antennae are the sole olfactory organs in *blatta orientalis*, contrary to Graber's view that the cerci of these insects are able to perceive odors. *G: D.* (4448)

Radoszkowski Octav Ivan. Revision des armures copulatrices des mâles de la famille de mutillides. (Horae Soc. entom. ross., 1885, v. 19, p. 3-49, pl. 1-11.)

Regards the form of the genitalia of the males of *mutillidae* as often indispensable in separating the species; figures and describes the male genitalia of many species of the family, after having rendered these parts transparent by soaking them in a solution of caustic potash [KOH]; general structure and nomenclature of the parts of the male genitalia, in which the part termed *squama* in *bombus* is given the name *tenaculum;* characterizes the genera, adding 3 new genera; *dasylabris, edrionotus,* and *tricholabioides.* *G: D.* (4449)

Rey, Claudius. Comparaison entre plusieurs larves de divers genres d'élatérides. (Ann. Soc. linn. de Lyon, 1883, 1884, n. s., v. 30, p. 443-446.)

Classification of the larvae of the *elateridae* by use of the structure of the last abdominal segment. *G: D.* (4450)

Rey, Claudius. Description de la larve de l'*anthicus floralis* Linné. (Ann. Soc. linn. de Lyon, 1882, 1883, n. s., v. 29, p. 141-142.)

Describes the larva of *anthicus floralis* in detail. *G: D.* (4451)

Rey, Claudius. Quelques exemples de monstruosités chez les coléoptères et hémiptères. (Ann. Soc. linn. de Lyon, 1883, 1884, n. s., v. 30, p. 423-424.)

Brief notes on eight deformed coleoptera and on two hemiptera. *G: D.* (4452)

Rollast, Georges. Catalogue des chenilles européennes connues. (Ann. Soc. linn. de Lyon, 1882, 1883, n. s., v. 29. p. 251-363; 1883, 1884, v. 30, p. 70-152.)

Catalog of the known larvae of European lepidoptera, with their food-plants or food-habits and the time of their appearance; prefaced to this list, which includes some species found in America, is a list of the works consulted in its compilation. *G: D.* (4453)

Rudow, Ferd. Beobachtungen über die lebensweise und den bau der mallophagen oder pelzfresser, sowie beschreibung neuer arten. (Zeitschr. f. d. gesammt. naturwissensch., 1870, v. 35, p. 272-302; 1870, v. 36, p. 121-143.)

Rev. (BRAUER, F. Bericht . . . der entom. f. 1870, 1873, p. 118-119.)

Literature of *mallophaga;* notes upon their systematic position, habits, external and internal structure, and hosts; the structure of the mouth-parts, and their value in classification; classification of the genera of the *mallophaga,* and descriptions of new species belonging to the genera *lipeurus, metopeuron* (n. g.), *ornithobius,* and *trichodectes.* This paper is a continuation of the author's "Neue mallophagen" (*op. cit.,* 1869, v. 34, p. 387-407) [Rec., 4457]. *G: D.* (4454)

Rudow, Ferd. Neue mallophagen. (Zeitschr. f. d. gesammt. naturwissensch., 1869, v. 34, p. 387-407.)

Rev. (BRAUER, F. Bericht . . . der entom. f. 1869, 1871, p. 167, 175-176.)

Describes new species of *mallophaga* from the Hamburg museum, belonging to the genera *colpocephalum, menopon, laemobothrium,* and *trinoton,* of the family *liotheidae.* This paper is continued in the author's "Beobachtungen über die lebensweise und den bau der mallophagen" . . . (*op. cit.,* 1870, v. 35, p. 272-302) [Rec., 4456]. *G: D.* (4455)

ENTOMOLOGICAL ITEMS.

ODOROUS BUTTERFLIES. — The butterflies of India seem to be often odorous. In a "List of the lepidopterous insects collected in Cachar by Mr. Wood-Mason, part 2, Rhopalocera," by Messrs. J. Wood-Mason and L. de Nicéville (Journ. Asiatic society of Bengal, 1886, v. 55, pt. 2, no. 4, p. 343-393, pl. 15-18), among the 249 species found in that district, twelve species are mentioned as odorous. Five species of *nymphalidae* are described as having vanilla-scented males. Of *Stichophthalma camadeva*, Mr. Wood-Mason writes, "The gland covered by a patch of modified scales and by an erectile wisp of hairs on each hind wing in the male, secretes a fluid that gives out a pleasant odor distinct from, but so faint as barely to be perceptible in the presence of a much stronger odor (resembling that of sable fresh from the furrier's shop) which is common to the two sexes." Of the male of *Catopsilia gnoma* it is said that the tufts of hair on the wings smell like jessamin. Three species of *papilionidae* are mentioned as having a musky odor. *Papilio dasarada* is described as having "a strong scent of caged porcupines with a touch of musk." In *P. aristolochiae* "the male emits a strong and slightly pungent odor resembling that of ? batchelor's buttons or of the rose with a trace of acetic acid." *G: D.*

NECROLOGY. — Since our last necrological notice (PSYCHE, Jan.-Mar. 1885, v. 4, p. 266), news has been received of the death of the following entomologists, or persons who have contributed to entomological literature: Spencer Fullerton Baird, secretary of the Smithsonian institution, at Washington, D. C., zoologist, b. 3 Feb. 1823, in Reading, Pa., d. 19 Aug. 1887, at Woods Holl, Mass. Heinrich Anton de Bary, cryptogamic botanist, b. at Frankfort-on-the-Main, Germany, 26 Jan. 1831, d. 19 Jan. 1886, at Strassburg, Germany. Dr. Edward Becher, entomologist and assistant in the royal museum in Vienna, Austria, d. in that city, 11 Nov. 1886. Thomas Bland, entomologist and conchologist, b. 4 Oct. 1809, in Nottinghamshire, Engl., d. 20 Aug. 1885, in Brooklyn, N. Y. Henri Brisout de Barneville, entomologist, d. 23 Jan. 1887, in Saint-Germain-en-Laye, France. Dr. Adam Todd Bruce, anatomist and embryologist, instructor in Johns Hopkins University, d. in Cairo, Egypt, 11 Feb. 1887. Nicholas Cooke, lepidopterist, b. 14 Jan. 1818, at Liverpool, d. 19 May 1885, at Leatherhead, England. Thomas Cooke, London entomologist, b. in 1814, d. 10 June 1885. Carl Cornelius, teacher in the Realschule in Elberfeld, from 1833 to 1874, who has contributed largely to the literature of the biology of insects, b. 17 Nov. 1805, in Soest, Germany, d. 1 April 1885, in Elberfeld, Germany. Thomas Edward, whose life is told by S: Smiles in his "Life of a Scotch naturalist," b. 25 Dec. 1814, in Gosport, d. 27 April 1886. James English, entomological collector, d. 12 Jan. 1888, in Epping, England, aged 67 years. William Farren, entomological collector, d. at Cambridge, Engl., 21 Nov. 1887, aged 51 years. John Firth, lepidopterist and ornithologist, d. in Bradford, Engl., 29 Aug. 1885, aged 53. Dr. Heinrich Leopold Fischer, professor of minerology but well known as a writer on orthoptera, d. in Freiburg, i. Br., Germany, 1 Feb. 1886. Herrmann Friedrich Rudolf Heinrich Gadamer, forester, entomologist and ornithologist, b. 2 May, 1818, in Silesia, d. at Raslätt, near Jönköping, Sweden, 24 April 1885. Dr. Max Gemminger, coleopterist, b. 23 Jan. 1820 [? 20 Jan. 1822] in München, Germany, d. 18 Apr. 1887, in the same city. Maurice Girard, a well-known Parisian entomologist, d. in Aug. 1886, aged 64, at Lion-sur-mer, France, during his summer vacation. Gustav Haller, entomologist, student of *acarina*, d. 1 May 1886, in Bern, Switzerland. James Hamer, entomological collector, d. at Southport, Lancashire, Engl., 14 Nov. 1887, aged 46 years. Oscar Harger, zoologist and pa-

leontologist, b. 12 Jan. 1843, in Oxford, Conn., d. 6 Nov. 1887, in New Haven, Conn. Baron Edgar von Harold, coleopterist, d. 1 Aug. 1886, in Possenhofen, near München, Germany. Rev. John Hellins, lepidopterist, d. in Exeter, Engl., 9 May 1887, aged 58. C. W. Hering, lepidopterist, d. in Stettin, Germany, 1 Feb. 1887, aged 85. Franz Höllmer, lepidopterist, b. 29 Sept. 1820, in Borgholzhausen Kreis Halle, Westphalia, Germany, d. 11 April 1885, in Münster, Westphalia. Johann von Hornig, lepidopterist, d. 29 Nov. 1886, in Vienna, Austria. Nicholas Joly, professor in Toulouse, d. there 17 Oct. 1885, Dr. Wilhelm Kaiser, zoologist, b. 1 Feb. 1841, in Arnsberg, Germany, d. 2 Sept. 1884, in Elberfeld. Frederick W. Klages, collector of insects, d. in Pittsburgh, Pa., 27 March 1886, in his 27th year. Albert Kothe, lepidopterist, b. in 1828, in Berlin, Germany, d. 12 Oct. 1885, in that city. Antonio de Lacerda, entomologist, d. in Bahia, Brazil, early in Aug. 1885, at the age of 51. Charles Lambin, coleopterist, d. at Paris, France, 8 Oct. 1885, at the age of 63 years. Jules Lichtenstein, entomologist, d. at Montpellier, France, 30 Nov. 1886, at the age of 68. Valère Liénard, anatomist and entomologist in Ghent, Belgium, b. in 1856, d. 20 Aug. 1886, in Brussels. Robert Francis Logan, lepidopterist, d. in Spylaw, Colinton, near Edinburgh, Scotland, 28 July 1887. Charles Martin, entomological collector and lieutenant of infantry in the French expedition to Tonquin. Philipp Leopold Martin, taxidermist and museologist, d. 8 Mar. 1885 in Stuttgart. Ferencz [= François] Metelka, entomologist and pharmacist, b. 21 July 1814, at Hatvan, Hungary, d. 9 March 1885, at Alsó-Dabas, Hungary. Pierre Millière, entomologist, writer on the biology of lepidoptera, d. at Cannes, France, 29 May 1887, aged 74. Dr. Henri Milne-Edwards, eminent zoologist and dean of the scientific faculty at Paris, b. 23 Oct. 1800, in Bruges, France (now Belgium), d. 29 July 1885, in Paris, France. Max Mützell, lepidopterist, d. 16 April 1887, in Berlin, Germany. Karl Plötz, lepidopterist, d. in Greifswald, Germany, 12 Aug. 1886, aged 73. Dr. François P. L. Pollen, zoologist and explorer of Madagascar, b. 7 Jan. 1842, in Rotterdam, Holland, d. 7 May 1886, in Leiden, Holland. John Arthur Power, M. D., coleopterist, b. 18 March 1810, d. in Bedford, Engl., 9 June 1886. Charles Phillippe Robin, French senator, physiologist and entomologist, b. 4. June 1821, at Jasseron, dept. de l'Ain, France, d. 6 Oct. 1885, near Jasseron. John Sang, lepidopterist, d. in Darlington, Engl., 19 March 1887, aged 59. Jörgen Christian Schiödte, entomological writer since 1836, b. 20 April 1815, in Copenhagen, d. 22 April 1884, in the same city. Joseph Sidebotham, astronomer, entomologist and botanist, d. at Bowdon, near Manchester, Engl., 30 May 1885, at the aged of 62. Carl Theodor Ernst von Siebold, distinguished naturalist and since 1853 professor of zoology at München, Germany, b. 16 Feb. 1804, in Würzburg, Germany, d. in München, 7 April 1885. Dr. Georg Simmermacher, a young zoologist, d. 18 May, 1885, in Giessen, Germany, in consequence of accidental poisoning by arseniuretted hydrogen. Gabriel Tappes, entomologist, d. at Batignolles, Paris, 27 Sept. 1885, in his 70th year. Jean Jacques de Tschudi, Swiss traveler and naturalist, d. in St. Gall, Switzerland, 25 Jan. 1886, aged 68. Antonio Villa, naturalist and author of numerous entomological papers, d. 26 June 1885, in Milan, Italy. Adolf Werneburg, forester and lepidopterist, d. 21 Jan. 1887, in Erfurt, Germany. Hendrik Weyenbergh, professor of zoology in Córdoba, Argentine Republic, entomologist, d. in Harlem, Holland, 25 July 1885, aged 42; he was at the time on a visit to his native country. Thomas Wilson, entomologist, d. in York, Engl. 17 April 1887, aged 51. *G. D.*

Nos. 141-142 were issued 9 Feb. 1888.

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CONTENTS:

ADVERTISEMENTS 38
A NEW PARASITE OF THE HESSIAN FLY — *Stephen Alfred Forbes* 39–40
NOTES ON CROESUS LATITARSUS, NORTON, AND DESCRIPTION OF THE LARVA— *John George Jack* 41–42
SOUND SLEEP OF LYCAENA AMERICANA — *Caroline G. Soule* 42
GONIA SENILIS WILLISTON — *Charles William Woodworth* 43
THREE RARE ENTOMOLOGICAL WORKS 43
EGG-LAYING OF LIMENITIS DISIPPUS — *Caroline G. Soule* 43
PROCEEDINGS OF SOCIETIES — Cambridge Entomological Club 44
BIBLIOGRAPHICAL RECORD, no. 4456–4476 45–46
ENTOMOLOGICAL ITEMS 47–48

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INDEX TO ENTOMOLOGICAL LITERATURE.

Having accumulated an immense stock of references to the literature of entomology, I will furnish references on special subjects at ten cents each reference, or fifty cents per decade. For further particulars see PSYCHE for Oct.-Dec. 1884, v. 4. p. 223.

B: PICKMAN MANN,
Washington, D. C.

LIBRARY OF THE CAMBRIDGE ENTOMOLOGICAL CLUB.

The librarian of the Cambridge Entomologica Club calls attention to the desirability of preserving in the library of the Club as complete a series of entomological publications as it is possible to collect. It is especially desirable to preserve the transient literature of the subject—separates, small pamphlets and newspaper articles—and the librarian will be pleased to receive single copies of the daily papers, scientific journals, magazines, or agricultural papers, which contain entomological articles. These papers are preserved and catalogd, and, because they are overlooked by large general libraries, are just the kind of material that should be preserved in a special entomological library. Any one who has sought for some of the best of the agricultural journals of the western states in libraries will appreciate any effort made to preserve journals of this sort.

Separates which are often thrown into the waste-basket, as useless, as too small for preservation, as duplications of parts of serials, or as valueless, are respectfully solicited. The friends of the Club are also asked to send a copy of newspapers in which they have published articles or notes on entomological subjects. If these notes are anonymous, the author's name will be acceptible information.

The accessions to the library of the Club had reached the number of 1643 at the end of last year (1887).

Direct all papers for the library to

CAMBRIDGE ENTOMOLOGICAL CLUB,
Cambridge, Mass.

PSYCHE.

A NEW PARASITE OF THE HESSIAN FLY.

BY STEPHEN ALFRED FORBES, CHAMPAIGN, ILL.

Parasitism of the winter brood of the Hessian fly has been but rarely and doubtfully reported, and so far as I know, has not hitherto been strictly authenticated. An observation recorded by Prof. Herrick in 1841[1], probably referring to the parasite now known as *Platygaster herrickii*, Pack., implies an abundant development of that species in the hibernating generation of the "fly," but this observation was almost certainly incorrect in some respects,—as has been shown by Mr. Howard,[2]—and has not been verified in this particular.

The breeding of unknown parasites from infested wheat in spring was reported by the writer in 1885;[3] but the breeding cage management in this case was not such as to make it certain that these were derived from the Hessian fly. The following instance is, consequently, probably the first to establish clearly the occurrence of this phenomenon.

From a field of wheat sowed after oats and corn in the autumn of 1886, living plants containing numerous puparia of the Hessian fly were sent to me Mar. 15, 1887, by my correspondent Samuel Bartley, Esq., of Edgewood, in southern Illinois. A number of these puparia were enclosed in a dry vial; and from them seven imagos of *Cecidomyia destructor* emerged previous to the 23d of April. This vial was not again examined until Oct. 18, when seven proctotrupid parasites were found in it—all dead. These belonged to the genus *Platygaster*, as limited by Foerster[4] and Thomson,[5] and to a species apparently undescribed.

Platygaster hiemalis, n. s.

General surface smooth, shining black; head opaque, very slightly pubescent, not cuboid, wider than thorax, nearly twice as wide as long. Temples narrow, vertex not margined, but minutely transversely rugulose. Front also transversely corrugated above the antennae, this corrugation merging in a general irregular lineation of the face. Upper half of front regularly convex, lower with a slight vertical carina commencing between the bases of the antennae. Ocelli not elevated, lateral ones equidistant from the eye and the median ocellus.

Thorax short, deep, very convex, not compressed; prothorax minutely transversely lineate at the sides; mesothorax shining, ovate, broadest just before wings, dorsum bare in middle, elsewhere with sparse gray hairs, sides more hairy in front. Parapsidal grooves scarcely visible. Scutellum semi-circular, vaulted, nearly hemispherical, without angle or process,

[1] Herrick, C. E. A brief preliminary account of the hessian-fly and its parasites. (Amer. journ. sci. and arts, 1841, v. 41, p. 153-158), p. 157.

[2] Howard, L. O. (3d rept. U. S. entom. comm., 1883, p. 219, foot note.)

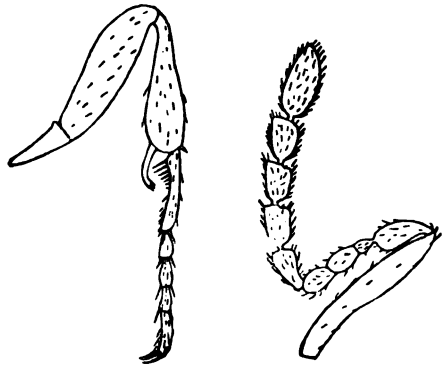
[3] Forbes, S. A. (14th rept. State entom. Ill., p. 46, foot-note.)

[4] Foerster, A. Hymenopterologische studien, heft 2, 1850, p. 108 and 115.

[5] Thomson, C. G. Sveriges proctotruper. (Öfvers. af Kongl. vetensk.-akad. förhandl., 1859, v. 16, p. 69-87) p. 83.

conspicuously hairy in front and at sides, bare and shining in middle; separated from mesoscutum by a rather deep transverse groove with two large coarsely punctate and hairy foveae. Dorsal outline of thorax consequently broken at scutellum. Tegulae shining, smooth, slightly embrowned. Metathorax hairy above and on sides.

Abdomen obovate, not narrowed at tip, smooth, shining, except first segment, which is covered with long gray hairs above and beneath, and the tip of the abdomen, which is slightly hairy at posterior edges of segments. Second segment with elongate basal foveae above, and a longitudinal basal groove on each side beneath, slightly concave to the margin, and extending two-thirds the length of the segment.



Antennae ten-jointed, black, with scape long, sinuous, and not clavate, and reaching to top of head. Club five-jointed in female, six-jointed in male, not compressed, more hairy than scape and funicle. First joint of latter obovate; second small, one-half to one-third the third,—the latter excurved and obliquely truncate in male, similar to fourth in female. First joint of club obconical, remaining joints, except the last, quadrate, nearly equal in length, about two-thirds as wide as long. Last joint in female ovate, obtuse, not much longer than the preceding: in male narrower, acute, nearly twice as long as preceding.

Head, thorax, and abdomen black throughout. Anterior legs yellowish shaded with fuscous, except coxae and distal joint of tarsi, which are black on all the legs. Middle legs darker, hind legs black, except tarsi and band at upper end of tibia. Upper surface of all the femora black. Wings extending far beyond the abdomen, hyaline, iridescent.

Total length of head and body .94 mm.; fore wings .84 mm. long, .35 mm. wide. Head .35 mm. wide, .185 mm. long; thorax .36 mm. long, .29 mm. wide, and .30 mm. deep. Abdomen of female .46 mm. long, .30 mm. wide.

This species differs from *Platygaster herrickii* (authentic specimens of which Mr. L. O. Howard has kindly sent me) chiefly in its much smaller size, more shining aspect,—due to the absence of the reticulate finish of the surface characteristic of *P. herrickii*, —by the shorter and more vaulted thorax, by the corrugated, narrower, and more convex vertex, and the narrower temples,—the head having a less cuboidal form,—but especially in the parapsidal grooves, which in *Platygaster herrickii* are very large and distinct, and in *P. hiemalis* are barely visible in the most favorable light.

From *P. minutus*, very briefly described by Lindeman,[6] it differs in size, and conspicuously so in the proportions of the antennal segments,—Lindeman's species being only .5 mm. in length, and the antennal scape about twice as long as the first joint of the flagellum.

[6] Lindeman, K. Die pteromalinen der hessenfliege, *cecidomyia destructor* Say. (Bull. Soc. impér. natur Moscou, 1887, no. 1, 177-192.) Separate, p. 12.

NOTES ON *CROESUS LATITARSUS*, NORTON, AND DESCRIPTION OF THE LARVA.

BY JOHN GEORGE JACK, JAMAICA PLAIN, MASS.

In the latter part of August, 1886, I collected a number of sawfly larvae, found feeding upon the foliage of *Betula alba* and *B. papyrifera*, in this vicinity. These larvae were nearly fully grown and during the first week in September they all entered some loose soil and debris and made brownish, oblong cocoons about 12 mm. long, and 6 mm. in diameter. These were kept out of doors in a tin box, all winter, and some of the perfect insects emerged 11 May, 1887.

On 14 June I found larvae in almost all stages of growth, feeding upon birch trees in the Arnold Arboretum and other places in the vicinity of Boston. There were larvae nearly fully grown, while others were just hatched, and portions of the egg-shells remained, arranged along the principal veins of the leaf. About 18 June many of the large larvae entered the soil to pupate, and they emerged as perfect insects 15-20. Aug. Fresh specimens continued to appear from pupae for about two weeks after the last date.

Larvae were found in all stages of growth on 5 September. Most of these had gone to the ground to pupate by 1 October. Very few were found after that date.

The following is a rough description of the mature larva. Head black, shining. Body dull yellowish green, the last two segments being rather lighter than the others and varying to yellowish, especially beneath, and at the extremity of the ventral segment. A broad stripe, free from spots, extends along the dorsal surface, from the head to the anal segment. On each segment, just above the line of spiracles, there is a large, irregular, black spot on each side of the body. On the anal segment, however, they are generally very indistinct. The spots are usually connected together by a cloudy band which is sometimes so dark as to seem almost like an unbroken black stripe. Above the tip of the anal segment there is a large triangular or shield-shaped spot. Below the line of spiracles, and above the legs, there are several black spots, somewhat irregular and confused on the thoracic segments, but becoming more regular and distinct on each succeeding abdominal segment, until, on the last segment with prolegs, they appear as two distinct oblong spots on each side. On the eleventh segment the spots are less distinct and often seem reduced to one, and in the last two segments they are entirely wanting. The ventral surface, between the legs, is usually more or less black. The tibiae, tarsi, claws, and basal portion of the femora of the legs are dark brown on the external side. The prolegs are pale yellowish green and without spots. There are a few very short hairs on the head, along the sides, on the ventral segment around the anus, on the legs, and several on each of the prolegs. Length 20–25 mm.

The young are pale green and the spots are quite pale, but become darker and more distinct as the larvae increase in size. The larvae feed together until

they are about fully grown when they become more scattered. The abdomen is kept slightly raised, but is lifted much more, and the ventral surface exposed, when disturbed. They occurred in sufficient numbers last year to defoliate many young birches and destroy large portions of the foliage of some larger trees. They seemed to devour any species with equal avidity, and these included *Betula alba*, *B. lenta*, *B. lutea*, *B. nigra*, and *B. papyrifera*.

In some respects this larva resembles that of *Croesus septentrionalis* of Europe, but in the latter, the spots are all much more distinct and separate, the upper row are not connected by the brown band, the legs are not so brown, and the prolegs are tipped with brown.

Mrs. A. K. Dimmock in "The insects of Betula in N. A." (Psyche, 1885, v. 4, p. 286) in giving references to this insect says, "Norton (Proc. entom. soc. Phil., 1862, v. 1, p. 199) describes the male of this species and later (Trans. Am. entom. soc., 1867, v. 1, p. 84) describes the female." This is evidently a mistake as both of Norton's descriptions refer to the female.

All the specimens raised by me were females, and there are ten specimens, all females, in the Museum of comparative zoology at Cambridge, Mass., which were collected by J. Shute at Woburn, Mass., in 1870. The only male I have seen is an imperfect one in the Harris collection. In his catalog Harris wrote "Larva on birches, gregarious, Sept., winged May 1, 1827, do. Aug. 5, 1831."

The only references I have seen regarding the larva is at the end of Norton's description of the female (Trans. Am. entom. soc., 1867, v. 1, p. 84) where he says, — "Quite rare, wild cherry, Aug. 16. Bred by Mr. Walsh from larvae feeding on birch." Was the "wild cherry" referred to, the cherry birch, *Betula lenta?*

SOUND SLEEP OF LYCAENA AMERICANA.

A few years ago, being detained in Boston until the middle of August, and having few butterflies to study, I was led to notice those few very carefully, especially *L. americana*, which was very abundant in the vacant lots, and the grass-plots in Marlborough street.

I noticed that, as one side of the street grew shady, towards sunset, *L. americana* might be seen clinging to grass-blades, and with wings somewhat drooped, suggesting that the muscles were relaxed by sleep.

Approaching one, I gently touched the grass, but the butterfly remained as before. I shook the grass, then shook it less gently, but the butterfly did not stir. Then I picked the blade, and carried it in my hand, not taking any care to keep it upright, for five blocks, and even then it was only as the sun struck the grass, when I crossed the street, that the butterfly awoke, and lazily flew to a shady place, resting as before. I followed, and this time a touch was enough to startle it. I did not arouse it a third time, but afterwards, in the country, I tried the experiment several times, always with the same result.

I have always found the butterfly in the same position, more than half-way up the grass-blade, in the shade, and with the head up, the wings drooped to an acute, instead of a right, angle with the body. It certainly sleeps very soundly, and when aroused, does not become as active as in the middle of the day.

I have waked and disturbed one *L. americana* six times, each time immediately after it had settled down after a former awakening, and even the last time it flew but ten steps or so, and settled down as before.

Caroline G. Soule.

PSYCHE.

CAMBRIDGE, MASS., APRIL 1888.

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Works on subjects not related to entomology will not be reviewed in PSYCHE.

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GONIA SENILIS WILLISTON.

I had the good fortune to find two specimens of this pretty species of *tachinidae* in the Löw collection from Texas.

The species was described in the number of the *Canadian entomologist* for January 1887 from a single specimen from western Kansas. The specimens that I examined agree with the description in all respects except in the coloration of the abdomen. In one of them the abdomen was wholly black, with the ordinary pilose bands along the edge of each segment, appearing very much like that of *Gonia frontosa* Say. The other specimen on the contrary, had a large amount of red on the abdomen, reminding one of the abdomen of *Gonia exul* Williston, there being only a median line black in the first, second and third segments, and even a trace of red on the base of the fourth. The only other difference observable between these two specimens was the slightly smaller size, shorter wings and less number of black hairs on the base of the antennae, in the second specimen.

There can be no doubt, I think, that these specimens are *Gonia senilis* Williston, because of the agreement in all characters except the color of the abdomen; and, besides, this character is variable in the other species of this genus, but never as far as I know, to anywhere near the extent that it is in this species.

C: W: Woodworth.

THREE RARE ENTOMOLOGICAL WORKS.

The library of the Museum of comparative zoology at Harvard university has lately obtained the following rare works.

The author's original copy of Townend Glover's "Engraved plates of his Illustrations of North American entomology, colored by the hand of the author; also a few original drawings." These are in five quarto volumes.

By the same author, "Original drawings, principally of cotton insects and other insects injurious or beneficial to agriculture." In two octavo volumes. "Only 15 copies of these plates were printed for private distribution. The drawings are dated 1854 to 1857. A number of plates of lepidoptera are added, produced by the mechanical transference of the wing-scales to paper."

By the same author, "Proofs from ten early copper plates, the author's first attempt at an illustrated work on entomology."

EGG-LAYING OF LIMENITIS DISIPPUS.

Mr. Scudder asks (PSYCHE, v. 3, p. 30) if I am "confident that the several eggs on a given leaf were all laid by the same butterfly."

I cannot be absolutely sure of the first one laid on the leaf having four eggs, for that I did not see deposited—as I did the others—owing to the steepness of the bank and the low poplars which were abundant enough to impede my progress.

The eggs all hatched within twenty-four hours after the first larva appeared.

There was more difference in their pupation, the first and last being four days apart; and in their emerging there was a difference of six days between the first and last.

My whole experience with *L. disippus* was a surprise to me, for I had found but one or two larvae before last summer and had never seen the eggs, while, last summer, I found more larvae of *L. disippus* than of any other butterfly, and found so many eggs, on poplar leaves, that I gave up collecting them.

Caroline G. Soule.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

11 Dec. 1885.—The 115th meeting. [*Continued from v. 4, p. 338.*]

Dr. G: Dimmock showed samples of the different grades of Central American cochineal, carminic acid and some of its salts.

Dr. G: Dimmock showed specimens of several curious insects. Among them was a *Culex* with a parasitic nematod (*? Gordius*) dissected from its abdomen. The specimen was taken near Leipzig, Germany. The parasite was very large, relatively to the size of the *Culex*. No parasitic worms had been previously recorded from *Culex*, except *Filaria sanguinis-hominis*, altho *Mermis* had been found in *Simulium reptans*, in *Tanypus nebulosus* and in a species of *Chironomus*, and *Gordius* had been taken from *Chironomus plumosus*.

8 JAN. 1886. — The 116th meeting was held at 61 Sacramento Street, Cambridge, 8 Jan. 1886; the president, Mr. S: H. Scudder, in the chair.

Nominations nos. 132–133 were acted on, and the following persons elected to active membership: 132. George H. Parker, of Cambridge, Mass. 133. H. F. Gilbert, of Somerville, Mass.

Nominations nos. 134–135, both for active membership, were presented, as follows: 134. P. S. Abbot, of Cambridge, Mass. 135. Frank S. Child, of Cambridge, Mass. Both were nominated by Messrs. G: Dimmock and S: H. Scudder.

The report of the secretary for 1885 was read and approved. [An abstract of this report is appended to the report of this meeting.] The presentation of the report of the treasurer for 1885 was delayed on account of the illness of Mr. B: P. Mann. The secretary then made a special report on the condition of the library [an abstract of which follows the report of this meeting].

The following officers were elected for the ensuing year: president, S. A. Forbes; secretary, Roland Hayward; treasurer, B: Pickman Mann; librarian, George Dimmock; members at large of the executive committee, T. W: Harris and S: H. Scudder. Mr. B: Pickman Mann was elected editor of *Psyche*, with power to choose his associates.

The retiring president, Mr. S: H. Scudder, then delivered his annual address upon "The development of the hexapod type in time." This address, which has not been published, was supplementary to that delivered 13 Feb. 1885, on "The geological history of myriopods and arachnids." [*Psyche*, Jan.–Mar. 1885, v. 4, p. 245–250.]

Dr. G: Dimmock showed specimens of the larva, pupa, and imago of *Tinea cloacella*. The larvae feed in *Polyporus betulinus*.

Dr. G: Dimmock described a process of preparing the larvae of insects by boiling them in strong alcohol, and exhibited specimens prepared in this way. Among the specimens shown were lepidopterous larvae probably *pyralidae*, which were taken in October 1885 from the larger stalks of *Zizania aquatica* (Indian rice) growing in a small stream in Arlington, Mass, near the boundary line between that town and Cambridge. The larvae eat out the scanty pith partitions and the inner portions of the larger stalks. The larvae are from two to three centimetres long, dirty white in ground color, with longitudinal brownish stripes upon the upper side, and a dark brown head and pronotum. They have eight pairs of legs; a pair each on segments 1–3, 6–9, and 12.

Abstract of Secretary's Report, 8 Jan. '86. By G: Dimmock.

The present meeting of the club is the 116th. In the last annual report of the secretary the number of active members was reported to be twenty-seven; of associate members, forty-nine. During 1885 no new members have been elected, and three persons have withdrawn, leaving twenty-four active members. One associate member, Mr. H. K. Morrison, died during the year, leaving forty-eight associate members. . .

The officers of the club have continued over from 1884, because of a lack of a quorum at the meetings.

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard; S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Contribution to American Bibliography of Insect Diseases.

(*Continued from p. 20.*)

1824.

Cist, Jacob. Notice of the *melolontha*, or may bug. (Amer. journ. sci. and arts, Aug. 1824, v. 8, p. 269-271, pl. 4.)

Report of the occurrence of *cordyceps* on *melolontha*. *S. A. F.* (4456)

1849.

Leidy, Joseph. [On the existence of entophyta in healthy animals, as a natural condition.] (Proc. Acad. nat. sci. Phil., 9 Oct. 1849, v. 4, p. 225-233.)

Account of vegetable parasites of *julus*, *passalus* and other animals, including descriptions of the new genera *enterobrus*, *cladophytum* and *arthromitus*. *S. A. F.* (4457)

1850.

Leidy, Joseph. [Entophyta in bodies of animals.] (Proc. Acad. nat. sci. Phil., 12 Feb. 1850, v. 5, p. 7, 8.)

Remarks on *mucor mucedo*, *achyla prolifera*, and some unnamed species in insects and crayfish. *S. A. F.* (4458)

Leidy, Joseph. [Entophytes in insects and myriapods.] (Proc. Acad. nat. sci. Phil., 19 Feb. 1850, v. 5, p. 8, 9.)

Remarks on species of *enterobrus*, etc. *S. A. F.* (4459)

Leidy, Joseph. Descriptions of new entophyta growing within animals. (Proc. Acad. nat. sci. Phil., 30 Apr. 1850, v. 5, p. 35, 36.)

Description of new genus (*eccrina*) and three new species. Remarks on development of *arthromitus*. *S. A. F.* (4460)

1851.

Leidy, Joseph. [Remarks on parasitism of insects. (Proc. Acad. nat. sci. Phil., 1851, v. 5, p. 204, 210, 211.)

Account of culture experiment with fungus of mole-cricket (*gryllotalpa americana*). Dr. Leidy remarks that amount of parasitism in insects is influenced by kind of food. Hemipterous insects are remarkably free from parasites; those eating decaying substances especially subject to them. *S. A. F.* (4461)

1858.

Gray, G: Robert. "Notices of insects that are known to form the bases of fungoid parasites. 4.° pp. 22, pl. 6. 1858."

"Privately printed by the author. No place of publication given on title-page, but probably London. A general summary with full account of literature of the subject, including American references and good plates reproduced from various sources." — *W: G. Farlow and W. Trelease* (Bibl. contrib., Libr. Harv. univ., no. 25, p. 17). *S. A. F.* (4462)

1869.

Riley, C: Valentine. The periodical cicada. (First ann. rept. State entom. Mo., 1869, p. 18-42.)

On p. 26, remarks on the enemies of the cicada, with note of Dr. W. D. Hartman on a greenish powdery fungus found within it. *S. A. F.* (4463)

Riley, C: Valentine. The white grub. (First ann. rept. State entom. Mo., 1869, p. 156-159, fig. 88-89.)

On p. 158 are notes and a figure of a *cordyceps* on the larva of the may-beetle. *S. A. F.* (4464)

1872.

[**Riley**, C; Valentine.] Remarkable parasitic fungus. (Sci. american, 25 May 1872, v. 26, no. 22, p. 347, col. 3, 16 cm.)

Figures a white grub with a *sphaeria* growing from its anterior end. *G: D.* (4465)

1883.

Farlow, W: Gilson. [Description of *botrytis rileyi* Farlow.] (Rept. U. S. dept agric., 1883, p. 121.)

Describes a new species of muscardine fungus found on the larvae of *plusia*. *S. A. F.* (4466)

Riley, C: Valentine. Reports of experiments, chiefly with kerosene, upon insects injuriously affecting the orange-tree and the cotton plant, made under the direction of the entomologist. (U. S. dept. agric.—Div. of entom.—Bull., no. 1, 1883,) p. 25.

Notice of a fungoid growth on *parlatoria* and *mytilaspis*, in a report made by Joseph Voyle. *S. A. F.* (4467)

1884.

Leidy, Joseph. Ant infested with a fungus. (Proc. Acad. nat. sci. Phil., 1 Jan. 1884, p. 9.)

Note on an undescribed fungus attacking *camponotus pennsylvanicus*. *S. A. F.* (4468)

1885.

Fletcher, James. [Remarks upon cutworms.] (Fifteenth ann. rept. Entom. soc. Ontario, 1885, p. 21.)

Account of an enormous "fatality" among cut-worms [larvae of *agrotis*] caused by an entomophthorous fungus. *S. A. F.* (4469)

1886.

Arthur, Joseph C: A new larval *entomophthora*. (Botan. gaz., Jan. 1886, v. 11, p. 14-17, pl. 2.)

Describes and figures *entomophthora phytonomi* on *phytonomus punctatus*. *S. A. F.* (4470)

[**Riley**, C: Valentine.] *Blepharoceridae*. (Amer. nat., July [22 June] 1881, v. 15.) (Riley, C: V. Entomology . . . [July 1881]), p. 567-568.

Account of various investigations into the natural history of *blepharoceridae;* description of larvae and pupae of these flies. *B: P. M.* (4471)

[**Riley**, C: Valentine.] *Blepharoceridae*. (Amer. nat., Sept. [23 Aug.] 1881, v. 15.) (Riley, C: V. Entomology . . . [Sept. 1881]), p. 748.

Records the discovery, by J. Q. Adams, of pupae and imagos of *blepharoceridae*, at Watertown, N. Y. *G: D.* (4472)

Rudow, Ferd. Einige beobachtungen über die lebensweise der heuschrecken. (Zeitschr. f. d. gesammt. naturwissensch., 1870, v. 36, p. 306-330.)

Rev. (Brauer, F. Bericht . . . der entom. f. 1870, 1873, p. 26.)

Observations on the life-history and habits of certain orthoptera; among others the effect of food upon the color of the intestine of *locusta viridissima* and *decticus verrucivorus;* food, carnivorous habits and mode of capturing their prey in *locusta viridissima* and in *acrididae;* growth and the consequent color-changes, molting, hibernation, oviposition, mode of hopping and flying, and reproduction of lost limbs in saltatorial orthoptera; sonifaction in the males and its presence in the females of *locustidae*, its use as an attraction to the opposite sex, and its relation to the weather; sonifaction by males, females and larvae of the *acrididae*, and by *blatta;* experiments tending to show that saltatorial orthoptera hear with the antennae; breeding habits; contests between males and other modes of rivalry while in pursuit of females; copulation between different species and between larvae of saltatorial orthoptera. *G: D.* (4473)

Rudow, Ferd. Einige neue ixoden. (Zeitschr. f. d. gesammt. naturwissensch., 1870, v. 35, p. 14-20.)

Describes 6 new species of *ixodidae*. *G: D.* (4474)

Rudow, Ferd. Einige pupiparen auf chiropteren schmarotzend. (Zeitschr. f. d. gesammt. naturwissensch., 1871, v. 37, p. 121-124.)

Notice. (Bertkau. Ph. Bericht . . . der entom. f. 1871-1872, 1876, p. 179.)

Describes 4 new species of *pupipara* from *chiroptera* ("mainly American"), as follows: *strebla longipes* from *phyllostoma hastatum*, *lipoptena dubia* from *noctilio dorsatus*, *nycteribia elongata* from *nyctophilus geoffroyi*, and *nycteribia varipes* from *miniopterus morio*. *G: D* (1475)

Schöyen, W. M. Bemaerkninger om enkelte variationer af vore rhopalocera. (Entom. tidskrift, 1885, v. 6, p. 139-144; Résumé, p. 214-215.)

Notes on specimens of *papilio machaon*, *pieris napi*, *argynnis freya* and *a. frigga* exhibiting colorational variation; on an anomalous specimen of *polyommatus phlaeas* with the ground color of the left anterior wing whitened; and on some varieties of *erebia;* considers the variation in *p. machaon* due to emergence under artificial conditions, and that of *p. phlaeas* due to accidental external influences on the pupa. *G: D.* (4476)

ENTOMOLOGICAL ITEMS.

DR. A. S. PACKARD has editorial charge of the entomological department of *Garden and forest*, a new weekly journal of horticulture, landscape art and forestry. The first numero is dated 29 Feb. 1888.

THE COLORADO potato-beetle in Europe.—The Colorado potato beetle has appeared in large numbers upon the potato-fields of Malitzsch, a village near Dommitzsch, in Saxony. It is believed, from the abundance of the beetles, that the species must have been introduced into that locality several years ago. The Prussian government is taking vigorous measures to exterminate the pest.—*Amer. naturalist*, Nov. 1887, v. 21, p. 1030.

TRAP-DOOR SPIDERS.—Rev. Nendick Abraham communicates a brief paper to the Proceedings of the Zoological society of London, (1887, p. 40-43) "On the habits of the tree trap-door spider of Graham's Town," in which he describes the mode of construction of the nests of these spiders in crevices and holes of the bark of trees, the way in which they hold the door of their nests closed, how they catch their prey, and other habits.

MENTAL POWERS OF SPIDERS.—The second numero of the *Journal of morphology* (December 1887, issued in March 1888) contains a paper by George W. and Elizabeth G. Peckham, entitled, "Some observations on the mental powers of spiders." The paper fills thirty-six pages, and is subdivided as follows: 1, introduction; 2, sense of smell; 3, hearing; 4, maternal emotions; 5, sense of sight; 6, color-sense; 7, feigning death; 8, mistakes of spiders.

NECTAR-SECRETING PLANT-LICE. Oregon is the place for nectar-secreting plant-lice. During the past fall I received twigs of spruce and willow from that state, which, though not more than six inches [15 cm.] long, contained at least a tablespoonful of crystallized sugar, which was both pleasant and sweet. This insect is a species of *Aphis*, and though possibly not equal to the bee, or to the manufacturer of our best cane-sugar, in her power to form an excellent article of sugar does surpass greatly the glucose factories in the quality of the product which she turns out. —A. J. COOK (*Science* 29 Jan. 1886, v. 7, p. 102).

A SCOURGE OF MOSQUITOES.—The city of Mexico, for a number of months past, has been afflicted with a scourge of mosquitoes. These insects have prevailed to such an extent that they have been a constant theme of discussion, and have, in a number of instances, caused sickness, and, it is said, even death, by their poisonous bites. Official bulletins have been issued by the director of statistics, Dr. Peñafiel, seeking information as to their habits, natural history, etc. Singularly, the species, which is a large one, has not been known, or at least has not attracted attention before the past year; and fears are entertained that the pest is of recent introduction. The varying abundance of different kinds of insects during different years renders such a view improbable; yet it is significant that the present species is new to science, never having been described by entomologists.—*Science*, 15 Jan., 1886, v. 7, p. 46.

PARASITIC TINEIDS, AND WASPS FRIENDLY TO BIRDS. — Occaionally, in a narrative of travels an interesting observation on insec-habits is made, and is very apt to be overlooked. Mr. E. A. Schwarz has handed us the following notes from "Die thierwelt im holländischen Guiana" von Aug. Kappler, *Ausland*, 1885. P. 617. No. 31. Speaking of *Bradypus cucculiger* [corr]. (Faulkner). an animal of the size of a cat, covered with a fur of dense hair-like wool; and belonging to the *Edentata*. he says "In this thick fur there lives as a parasite, a tineid, which when the animal is dead comes forth by the dozen and flies away." A parasitic tineid is certainly a curiosity.

P. 699, No. 35. Speaking of birds of the genus *Cacicus*, several of which inhabit Guiana, he says "Very remarkable are their friendly relations with several species of

Polistes, well known to the Indians and negroes. The nests of these birds are never seen without a nest of these wasps in the immediate vicinity—sometimes so near that the bird when entering its own nest, touches the combs of the wasps, which are not at all disturbed by this proceeding; but they vigorously resist any attempt to disturb the birds nests. I know three species which are thus friendly with these birds."—*Entom. americana*, Dec. 1885, v. 1, p. 178-179.

MIMETIC COLORATION OF PUPAE OF BUTTERFLIES.—In a paper by Gervase F. Mathew, entitled, "Life history of three species of western Pacific rhopalocera" (Trans. Entom. soc. Lond., 1885, p. 357-368), p. 364-365, after some remarks on the method employed by the author in rearing butterflies on board ship in empty biscuit tins, the following statement occurs:—

"The tins were secured upon a table in my cabin, and on the wall behind these were some pictures framed in maroon-colored velvet. One morning I noticed that a larva of *Papilio godeffroyi* had attached itself to a leaf which was almost touching one of these frames, and when I looked at it the next morning I was surprised to see that it had changed to a chrysalis of a beautiful deep rose-color. After this I thought I would try some experiments, so I pinned some twigs, to which were attached larvae that were on the point of changing, to pieces of cork, to which I had gummed scarlet, blue, black, yellow and white papers. Those placed on scarlet and white changed to rosy-pink chrysalids, those on blue and yellow to green, and those on black to very dark green. The chrysalids of *Papilio godeffroyi* have a thinner shell, and are more delicate than those of *Papilio schmeltzi*, and in consequence they were probably more susceptible to rays of light, for the former were more influenced by the color of the background than the latter. The newly changed chrysalids of both species were pale green, and it was not until several hours had elapsed that they assumed the color of their surroundings. They are also very soft, and are covered with a thin coating of some viscid substance, which may have the power of absorbing refracted rays of colorlight as they dry and harden."

VITALITY OF THE LARVAE OF BALANINUS.—In an article entitled "Vitality of the larvae of the nut-weevil," by F. W. Leggett, in the *Journal of the New York microscopical society*, for February 1886, v. 2, p. 30-31, the author writes:

Desiring to bleach a larva [of *Balaninus*] without destroying any of its softer parts, I placed one in a six-inch test-tube, filled to within one-half inch of its capacity, with peroxide of hydrogen, and here follows the result, as copied from memoranda made by me at the time: Put larva in test-tube at 7 p. m., Jan. 7th. Took it out at 5 p. m., Jan. 8th. Cut off a part of the side of the larva and mounted the piece cut off. At 7, the same evening, the creature was very lively. Placed it on a slide and looked at it through the microscope. The creature continued very lively the whole evening, altho the moisture from the wounded part dried, and fastened the larva firmly to the slide. Jan. 9th, 7.45 a. m., the the creature was still alive, altho the posterior end near the wound continued to be hard and dry. On Jan. 10th, at 2 p. m., I placed another larva of the nut-weevil in the same test-tube with the same peroxide of hydrogen, Like the former one, it immediately sank to the bottom, where it remained until Jan. 14th, at 7 p. m., when I removed it to a glass cup and laid it on its side. Into this cup I poured about twenty drops of water. On Jan. 15th, at 8.30 a. m., I found the creature expanding and contracting itself. Thinking that this motion might be an optical delusion on my part, I showed it to two members of my family. Both saw the movement distinctly, and further, when I touched the creature with a needle, saw it raise its head in an unmistakaby living manner. On Jan. 16, this larva was living and active.

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CONTENTS:

ADVERTISEMENTS 50
BIOLOGICAL NOTES ON SOME NORTH AMERICAN ICHNEUMONIDAE — *Clarence Moores Weed* 51-52
IDENTIFICATION OF THE NOTODONTIAN GENUS SCHIZURA OF DOUBLEDAY — *Alpheus Spring Packard* 53
UNUSUAL COCOONS OF LIMACODES SCAPHA — *Caroline G. Soule* 54
NOTE ON MELITAEA PHAETON — *Holmes Hinkley* 54
HABIT OF VESPA — *James Henry Emerton* 54
HABITS OF MYGALE IN CONFINEMENT — *James H: Emerton* 55
PROCEEDINGS OF SOCIETIES — Cambridge Entomological Club — Entomological Society of London 55-56
BIBLIOGRAPHICAL RECORD, no. 4477-4502 57-58
ENTOMOLOGICAL ITEMS 59-60

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INDEX TO ENTOMOLOGICAL LITERATURE.

Having accumulated an immense stock of references to the literature of entomology, I will furnish references on special subjects at ten cents each reference, or fifty cents per decade. For further particulars see PSYCHE for Oct.-Dec. 1884, v. 4, p. 223.

B: PICKMAN MANN,
Washington, D. C.

LIBRARY OF THE CAMBRIDGE ENTOMOLOGICAL CLUB.

The librarian of the Cambridge Entomologica Club calls attention to the desirability of preserving in the library of the Club as complete a series of entomological publications as it is possible to collect. It is especially desirable to preserve the transient literature of the subject—separates, small pamphlets and newspaper articles—and the librarian will be pleased to receive single copies of the daily papers, scientific journals, magazines, or agricultural papers, which contain entomological articles. These papers are preserved and catalogd, and, because they are overlooked by large general libraries, are just the kind of material that should be preserved in a special entomological library. Any one who has sought for some of the best of the agricultural journals of the western states in libraries will appreciate any effort made to preserve journals of this sort.

Separates which are often thrown into the waste-basket, as useless, as too small for preservation, as duplications of parts of serials, or as valueless, are respectfully solicited. The friends of the Club are also asked to send a copy of newspapers in which they have published articles or notes on entomological subjects. If these notes are anonymous, the author's name will be acceptible information.

The accessions to the library of the Club had reached the number of 1643 at the end of last year (1887).

Direct all papers for the library to

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PSYCHE.

BIOLOGICAL NOTES ON SOME NORTH AMERICAN ICHNEUMONIDAE.

BY CLARENCE MOORES WEED, COLUMBUS, OHIO.

The following memoranda concerning the life-history of some common species of *ichneumonidae* are based on a study of the collections and note boxes of the Illinois State laboratory of natural history, made during the winter of 1887-8, when the writer was connected with that institution. Though not of especial importance, it is believed that the observations here recorded will prove a useful contribution to our knowledge of the earlier stages of these interesting insects. All references to localities are to be understood as being in Illinois.

PIMPLA NOTANDA Cresson.

Two specimens of this handsome species were bred at Normal, 12 and 29 August 1884, from larvae of *Gelechia gallaesolidaginis* Riley. Others were swept from grass in McLean County, 22 June 1883; and from wheat in Clark County, 22 May 1884.

PIMPLA ANNULIPES Brullé.

During May 1887, a *Crambus* larva was found abundantly in a pasture field on the University farm, and a large number of specimens were placed under a bell-glass in the laboratory. The moths, which in all cases proved to be *Crambus exsiccatus*, began to emerge 24 May, and continued emerging until 9 June. At the latter date there were found in the cage a large number of specimens of *Apanteles crambi* Weed, a single example of *Pimpla annulipes* Brullé, and also a specimen of another large ichneumonid as yet undetermined. This was the only *Pimpla* bred from the lot, which consisted of something over a hundred *Crambus* cocoons.

Besides this bred specimen, a long series of this species were collected in the field. Localities and dates are as follows: Champaign County, 16 May, 12 June, and 3 July 1885 (sweepings); 7 Aug. 1886, and 15 Oct. 1887; McLean Co., 15 June, and 7 Nov. 1883; Tazewell Co., 14 Aug. 1883; Hancock Co., 26 June 1883 (sweepings in clover field); Marion Co., 20 Apr. and 20 May 1883 (sweepings in strawberry field); and in Knox Co.

PIMPLA CONQUISITOR Say.

We have one specimen of this handsome insect bred from *Orgyia leucostigma* at Normal, 14 July 1883; and another was bred, 28 June 1884, from the pupa of some lepidopterous leaf-roller on grass—the precise species not being known, as but the one example was collected.

Of a large series collected in the field mention may be made of those taken at Normal from May to October during 1882, 1883 and 1884; and of a fine female specimen taken on flowers at Champaign, 20 Sept. 1886.

PIMPLA INQUISITOR Say.

This species has been twice bred from *Orgyia leucostigma;* and an adult was noticed by Mr. H. Garman, at Normal, 21 June 1883, "attempting to sting," a full grown *Orgyia* larva. Another was bred from what was supposed to be a phalaenid larva on apple in 1885 — the host being collected 10 June, and the adult parasite emerging 29 June. The species has also been taken in the field at various times — among others at Urbana 13 June 1885, and 3 Oct. 1887, and at Normal 13 June 1883.

PIMPLA ALBORICTA Cresson.

A single specimen of this beautiful little insect was bred at Normal, 11 Aug. 1884, from an unknown lepidopterous leaf-rolling larva on sycamore (*Platanus*).

GLYPTA VULGARIS Cresson.

Two specimens of this species were bred during the summer of 1884 from larvae of *Botys insequalis* collected in June on thistle heads. Another emerged 24 July 1883, from a chrysalis in the fold of a strawberry leaf collected at Normal. Others were taken in the woods in Tazewell Co. 14 Aug. 1883; and on apple trees in McLean Co., 3 May 1884.

GLYPTA SIMPLICIPES Walsh.

A single specimen of this insect was bred 8 August 1884, from the cocoon of some leaf-roller on apple —just what species I cannot say. Both *Teras minuta* (Robs), and *Cacoecia rosaceana* Harr., were present in the field of young apple trees from which the cocoon was taken.

TROGUS OBSIDIANATOR Brullé.

The only bred specimen of this species emerged 13 June 1885, from a lepidopterous cocoon supposed to be that of *Pyrrharctia isabella*. Other specimens were collected in McLean Co., 16 June and 13 July 1882, and 26 June 1885.

TROGUS EXESORIUS.

This insect seems especially to attack the larvae of species of *Papilio*. Dr. A. S. Packard has noted[1] that it infests *P. asterias*, *P. troilus*, *P. turnus*, *P. ajax* and *P. marcellus*, and Mr. Frederick Clarkson has also bred it from *P. troilus*, and has made the interesting observation that the point of exit of the parasite is "the same in every case, viz., on the right or left side, about midway of the thorax, at the widest part.[2]

Four larvae of *Papilio asterias* were collected on parsnip, 23 July 1885, at Champaign. One specimen pupated 27 July, another 28 July, another 30 July. The date of pupation of the fourth larva was not recorded, but the first butterfly emerged 5 August, and a second one 17 August. A live *Trogus* was found in the cage 25 August, and another emerged 5 Sept. Hence it appears that the parasite remains in the pupa state somewhat longer than its host.

Other specimens of this insect were collected at Bloomington 23 Sept. 1879; and at Champaign 8 July 1887, the latter being taken in the woods.

[1]Proc. Bost. soc. nat. hist., Aug. 1881, v. 21, p. 21-22.
[2]Can. entom., Sept. 1883, v. 15, p. 162.

ICHNEUMON RUFIVENTRIS Brullé.

Two specimens of this handsome ichneumon were bred late in July 1884, from the chrysalids of *Pyrameis cardui*, the insects emerging as noted by Mr. Hart "by cutting a lid from the anterior end of the pupa." Other specimens were collected in Tazewell Co. during May, 1881, and in Union Co. 14 July 1880 and 14 Sept. 1883.

IDENTIFICATION OF THE NOTODONTIAN GENUS SCHIZURA OF DOUBLEDAY.

BY ALPHEUS SPRING PACKARD, PROVIDENCE, R. I.

In *The entomologist* for Feb. 1841, Edward Doubleday, in an article entitled, "Characters of three new genera of *notodontidae* from North America," describes and figures *Schizura ipomeae* giving the generic and specific characters in some detail, and illustrating, in a plate facing p. 60, the larva and pupa from manuscript drawings by John Abbot.

When preparing the manuscript of a monograph of the *bombycidae*, which was published in abstract under the name, "Synopsis of the *bombycidae* of the United States" (Proc. Entom. soc. Phil., 1864, v. 3, p. 97-130, 331-396), I was unable with certainty to identify the genus (the species not then being known to occur north of Florida), but placed it next to my genus *Coelodasys*. In 1855 Walker referred it to *Heterocampa;* but neither Mr. Grote nor Mr. H. Edwards have been able to identify it. While looking over, during the past winter, the volume of manuscript colored drawings by John Abbot, in the library of the Boston society of natural history, I found the original colored drawing, copied by Doubleday and described by him as the larva of *Schizura ipomeae*. The larva figured by Abbot I recognized as that of *Coelodasys biguttatus* Pack. which I reared last summer in all its stages from eggs kindly sent me by Miss Emily A. Morton, of Newburgh, N. Y.

On comparing my specimen of *C. biguttatus* with Doubleday's description both of the generic and specific characters, it agrees exactly, and leaves no doubt but that my genus *Coelodasys* is a synonym of Doubleday's *Schizura*. Hence the former name should be dropped and that of *Schizura* retained, and *C. biguttatus* should, with little doubt, be regarded as a synonym of *S. ipomeae*. Of *Coelodasys* I described also *C. edmandsii* and *C. harrisii*, besides referring *Notodonta unicornis* to it. My *C. cinercofrons*, as previously shown by Grote, is a melanitic variety of *C. biguttatus*. All these species which are valid should, then, be referred to *Schizura*.

I may also add that I have identified Doubleday's *Heterocampa astarte*, as Grote had previously done: the larva is represented by Doubleday's fig. 1, the pupa by his fig. 2. His *Lochmaeus manteo* I have also readily identified; Grote's *Heterocampa subalbicans* is a synonym of it. Doubleday's unnamed larva, figs. 3 and 5, is that of Walker's *Cecrita guttivitta*, referred by Grote so *Heterocampa*, and which I have teen in its early and imago stages in Prof. Riley's collection, having also collected the caterpillar myself either in Rhode Island or Maine.

PSYCHE.

CAMBRIDGE, MASS., MAY 1888.

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UNUSUAL COCOONS OF LIMACODES SCAPHA.

In October, 1887, Miss Ida M. Eliot sent me, from Nonquitt, Mass., several larvae of *L. scapha* on twigs of bayberry (*Myrica*).

To keep the food moist I put damp sand in a tin box, stuck the twigs into it, and placed the larvae on them.

One caterpillar made its cocoon in the usual way,—a tough, parchment-like case, but all the others spun bits of coarse sand into their cocoons, so that they look like nothing but lumps of sand. Beneath the sand, however, the cocoons show the normal kind and shape.

One larva added to the sand two bits of leaf, and the one which made the usual cocoon fastened it to a leaf.

Caroline G. Soule.

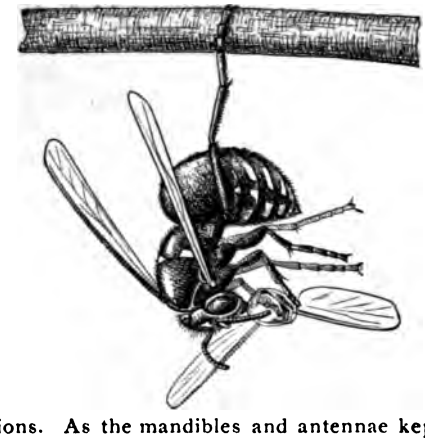
NOTE ON MELITAEA PHAETON.

On the third of last August I found, in Jefferson Highlands, N. H., a nest of young larvae of *Melitaea phaeton*. It was formed, as described by Mr. W: H: Edwards, by drawing together the leaves of the *Chelone glabra*, and a fern had also been worked into its construction. I allowed the main part of the colony to remain where it was found, removing only a small detachment. The larvae that were removed ate one or two meals, certainly not more, before going into winter quarters in a small nest which they constructed in their new home. Visiting the main colony of larvae from time to time through the month to compare their habits with those of the larvae in confinement, I was surprised, at that time not being familiar with their history, to find that they too had ceased to eat. On the twenty-seventh of the month I placed my smaller detachment in proximity to the larger community, often removing the smaller lot to a fresh sprig of *Chelone*, and found that the larvae soon rejoined their old companions, with whom they are now hibernating.

Holmes Hinkley.

HABIT OF VESPA.

While going through a swamp filled with alder bushes I noticed, hanging in the middle of one, a wasp devouring a fly in the position shown in the drawing. The wasp hung down by one foot. The abdomen was bent up out of the way. The half-eaten fly was held by the front feet, while the other legs and wings stuck out carelessly in all directions. As the mandibles and antennae kept in rapid motion and the fly was turned over and over by the fore feet, the wasp swung slowly back and forth with the same appearance of comfort and enjoyment as a man eating an apple in a hammock. When the fly had been reduced to wings and shell the wasp let it drop, got up on the twig and flew away.



James H: Emerton.

HABITS OF MYGALE IN CONFINEMENT.

Mr. Henry C. McCook has published (Proc. Acad. nat. sci. of Philadelphia for 1887) some notes on the habits of *Mygale hentzii* while kept in confinement in Philadelphia. Mr. McCook has had the best success in keeping spiders by feeding them well in summer and giving them but little during the winter, but lets them have all the water they want at all seasons. One *Mygale* lived over five years, and finally died soon after moulting, though it had moulted safely several times in previous years. The last moult happened in spring, before the spider had much to eat, and for this reason, probably, it was too weak to recover from the effects. One of Mr. McCook's mygales lost several limbs while moulting. He says "two of the legs refused to separate from the skin, and after a prolonged struggle they were broken off at the coxae and remained within the moult. One foot of another leg shared the same fate." This moult occurred in the spring. In August the spider moulted again, and by this time the lost limbs had grown again, complete but a little smaller than before.

The digging of these mygales was done with the fore legs and palpi. The dirt was not scratched up by the feet or kicked backward but gathered into balls between the mandibles, palpi and feet and carried away from the hole.

James H: Emerton.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

8 JAN. 1886. — The 116th meeting. [*Continued from p. 44.*]

Abstract of the Secretary's Report on the Library, 8 Jan. 1886. By G: Dimmock.

The circumstances which led the secretary to assume the duties of librarian are given in detail. . . .

The accession book has been written up to the end of 1885 and enumerates 1355 accessions. Of these 164 belong properly to the year 1885. . .

The books of the library have been classified by subjects according to the Dewey decimal classification. . . Only a small portion of the books are catalogd on slips. . . Some of the separates and smaller pamflets have been furnished with stiff manilla-paper covers, and many more separates need to be thus protected.

The rules concerning the loan of books remain the same as they were in 1882, when they were printed in our annual reports.

12 FEB. 1886.—The 117th meeting was held at 61 Sacramento St., Cambridge, 12 Feb. 1886. In the absence of the president, Mr. T. W. Harris was chosen chairman.

Mr. Roland Hayward remarked on the dilation of the first three joints of the middle tarsi of some of our species of *Dytiscus*. He asked if the patellae of the middle tarsi are functional or not.

Dr. G: Dimmock showed some specimens of *chrysomelidae* to illustrate the subject of color-variation, and made remarks upon experiments which he intended to try during the coming summer in order to produce color-varieties in insects.

12 MAR. 1886.—The 118th meeting was held at 61 Sacramento St., Cambridge, 12 March, 1886. In the absence of the president Prof. W: Trelease was elected chairman.

The report of the treasurer, Mr. B: P. Mann, for the year 1885 was read by the secretary, and having already received the approval of the auditing committee, was approved.

[An abstract of this report is appended to the report of this meeting.]

Nominations nos. 134–135 were acted upon and the following persons elected to active membership: 134. Philip Stanley Abbott, of Cambridge. 135. Frank Sedgwick Child, of Cambridge.

Nominations nos. 136–142, all for active membership, were presented, as follows: 136. Prof. T: J. Burrill, of Champaign, Ill.,

by Messrs. S. A. Forbes and W: Trelease. 137. W: H. Garman, of Champaign, Ill., by Messrs. Forbes and G: Dimmock. 138. Clarence M. Weed, of Champaign, Ill., by Messrs. Forbes and G: H. Parker. 139. Charles A. Hart, of Champaign, Ill., by Messrs. Forbes and F. S. Child. 140. T: F. Hunt, of Champaign, Ill., by Messrs. Forbes and R. Hayward. 141. Prof. C: Robertson, of Carlinville, Ill., by Messrs. Forbes and S: H. Scudder. 142. C: W: Woodworth, of Champaign, Ill., by Messrs. Forbes and Dimmock.

The receipt of an invitation to attend the celebration of the fiftieth anniversary of the Verein für naturkunde, in Cassel, Germany, was announced, and Messrs. S: H. Scudder and R. Hayward were appointed a committee to draft suitable resolutions.

Mr. S: H. Scudder remarked on a pre-historic beetle. Borings made by this insect had been found in juniper, which had been discovered in beds of the inter-glacial period. The species belongs to the *scolytidae*, probably to the subfamily *hylurgini*, as defined by Leconte and Horn. The paper was illustrated by drawings of the borings of this species, and those of existing *scolytidae*.

Dr. G: Dimmock showed a female of *Hippodamia convergens*, which had hibernated in a cold cellar. The beetle had copulated but once, and that in the fall. Dr. Dimmock gave statistics of the eggs which this beetle had laid, and which proved fertile, and made further remarks upon rearing *coccinellidae*.

Mr. S: H. Scudder made some remarks on *Melittia cucurbitae* and a related species. [See PSYCHE, July-Sept. 1885, v. 4, p. 303-304.]

Abstract of Treasurer's Report, 12 Mar. '86. By B: Pickman Mann.

Open accounts have been kept seperately with each volume of PSYCHE, or the years to which each corresponds. The account for volume one shows a deficit of $16.05; that of volume two, $239.59; that for the years 1880 to 1882, inclusive, a balance on hand of $34.59; that of volume four, not yet completed, already shows a deficit of $150.66. The principal of the permanent publication fund amounts to $386.39. [The Treasurer's report was duly audited and approved.]

ENTOMOLOGICAL SOCIETY OF LONDON.

(*Continued from v. 4, p. 314.*)

1 OCT. 1884.—Mr. R. McLachlan exhibited a specimen of *nemopteridae*, which was captured by Mr. J. J. Walker at Coquimbo. This was remarkable as hitherto no species of this family had been known to occur in America. This new species appeared to come nearest to *Brachystoma* Rambur.

Baron C: R. Osten Sacken communicated "Facts concerning the importation or non-importation of diptera into distant countries."

3 DEC. 1884.—Baron C: R. Osten Sacken was elected an honorary member of the society.

Mr. A. S. Olliff exhibited *Aciphus singularis*, recently described in the "*Entomologist's monthly magazine*," from Brazil. It had the appearance of one of the *staphylinidae*, but was a *Cucujus* strongly resembling *Diagrypnodes wakefieldii*, from New Zealand.

Mr. C: O. Waterhouse exhibited a specimen of *Julodis finchi* from Karachi, a buprestid of nearly twice the size of the largest hitherto known species, and recently described by him in the "*Annals and magazine of natural history.*"

Rev. Leonard Blomfield contributed a note on a beetle taken near Bath, England, which proved to be *Monohammus titillator*. It was taken by a man engaged in chopping wood that proved to be North American pine, and was the second specimen that had been taken alive in England.

Mr. H. J. S. Pryer contributed a paper "On two remarkable cases of mimicry from Elopura, British North Borneo, with remarks on Mr. George Lewis' paper read before the society on 4th October 1882"... [Several cases of mimicry were cited by Messrs. Butler and Waterhouse in discussing Mr. Pryer's paper; these citations are given in detail in the Proceedings.]—Abstracted and compiled from the *Trans. Entom. soc. Lond.*, 1884; Proc.

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard; S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Bassett, Homer Franklin. New *cynipidae*. (Can. entom., April 1881, v. 13, p. 74-79; May 1881, v. 13, p. 92-113.)

Describes 24 new species of *cynipidae*. *G: D.* (4477)

Beard, Daniel C. The Florida "mule killer," *thelyphonus giganteus* (Sci. amer., 5 Mar. 1887, v. 56, p. 153, 40 cm.)

Figures *thelyphonus giganteus* and gives notes on its habits; mentions a case of a man seriously injured by bites of this arachnid, and of two mules killed by bites of *thelyphonus*. *G: D.* (4478)

Bertkau, Philipp. Bemerkungen zu Schimkewitsch's notiz "Sur un organe des sens des araignées" in Zool. anz., no. 201, p. 464. (Zool. anzeiger, 14 Sept. 1885, v. 8, p. 537-538.)

Rev. of W. Schimkewitsch's "Sur un organe [etc.]" (*op. cit.*, 10 Aug. 1885, p. 464-466) [Rec., 4485]; notes on the structure of supposed auditory organs on the legs of *araneina*, with reference to what the author had already published on the subject. *G: D.* (4479)

Clayes, S. L. Cobwebs and how they are made. (Swiss cross, Jan. 1888, v. 3, p. 10-11, 57 cm.)

Mode of web-making by *epeira diadema*. *G: D.* (4480)

Müller, Hermann. Explanation of the female dimorphism of *paltostoma torrentium*. (Nature, 7 July 1881, v. 24, p. 214, 10 cm.)

In explanation of the female dimorphism of *paltostoma torrentium*, and the theories concerning it advanced by Fritz Müller (Kosmos, Oct. 1880, v. 8, p. 37-42) [Rec., 4444], the author mentions that in *empis punctata* the males suck nectar, while a part of the females do the same, and the others "attacked, murdered, and consumed" *rhingia rostrata*, a fly belonging to the *syrphidae*. *G: D.* (4481)

Müller, Fritz. Einige worte uber *leptalis*. (Jenaische zeitschr. f. naturwiss., Feb. 1876, v. 10, p. 1-12, il.)

Abstract, entitled, "Mimicry in butterflies explained by natural selection." (Amer, nat., Sept. 1876, v. 10, 534-536.) [Rec., 1017.]

Abstract. (Ann. record of sci. and industry, . . . S. F. Baird, 1876, p. 283-284.)

Discussion of mimicry, based upon studies of species of *leptalis* found in southern Brazil. *H: W. T.* (4482)

Müller, Fritz. Os orgaos odoriferos nas pernas de certos lepidopteres [e supplemento]. (Arch. do. Museu nacional do Rio de Janeiro, 1877, v. 2, p. 37-46, pl. 4-5.)

Notes on the various kinds of odoriferous organs and their situations in the lepidoptera; those which consist of tufts on the legs are more fully described, both in general aspect and in minute structure, and figures of these tufts and the modified scales which form them in *pantherodes pardalia* and in an erebid moth are given. *G: D.* (4483)

Schaupp, Frank G: Fertile eggs from a dead *arctia virgo*. (Bull. Brooklyn entom. soc., Feb. 1883, v. 5, p. 81.)

Eggs extracted from the body of *arctia virgo* hatched; might not larvae of a rare species be obtained similarly? *B: P. M.* (4484)

Schimkewitsch, Wladimir, Sur un organe des sens des araignées. (Zool. anzeiger, 10 Aug. 1885, v. 8, p. 464-466.)

Rev., by P. Bertkau, entitled "Bemerkungen zu Schimkewitsch's notiz "Sur un organe [etc.]." (*op. cit.*, 14 Sep. 1885, p. 537-538.)

Describes position and structure of sense-organs, comparable to Graber's chordotonal poriferous organs of insects, which are located on the palpi and legs of spiders. These organs are the same as those noted by F. Dahl, in his "Das gehör- und geruchsorgan der spinnen." (4485)

Shorten, J: W. *Macrosila cingulata.* (Journ. Cincinnati soc. nat. hist., April 1882, v. 5, p. 62.)

Records the capture of *macrosila cingulata* in the vicinity of Cincnnati, Ohio. *G; D.* (4486)

Siewers, C: Godfrey. Coleoptera. (Journ. Cincinnati soc. nat. hist., July 1882, v. 5, p. 96.)

Notes captures of *necrophilus subterraneus, limonius aurifer, strongylium crenatum*, and a variety of *arthromacra aenea.* *G: D.* (4487)

Siewers, C: Godfrey. *Formica rubor* and *formica niger.* (Journ. Cincinnati soc. nat. hist., April 1882, v. 5, p. 60-61.)

Describes a foray of a nest of red ants against a nest of black ants, in which the latter were made slaves; adds a few further remarks on the habits of queen ants and their slaves. *G: D.* (4488)

Smith, J: B. New noctuids and notes. (Bull. Brooklyn entom. soc., Jan. 1883, v. 5, p. 67-68.)

Describes *calymnia aequilinea* from Colorado, and *hadena juncimacula* from Utah, new species, each from one specimen; "*mamestra promulsa*" is not an *anarta*, as catalogued by A: R. Grote. *B: P. M.* (4489)

Taschenberg, E. L. Zur kenntniss der gattung *calopteron* Guér. (Zeitschr. f. d. gesammt. naturwissensch., 1874, v. 44, p. 79-102.)

Notice. (BERTKAU, Ph. Bericht . . . der entom. f. 1873-1874, 1877, p. 97.)

Describes 21 new species of *calopteron* from South America. *G: D.* (4490)

Vion, René. L'auscultation des arbres. (Bull. Soc. linn. du nord de la France, 1881, v. 5, p. 350.)

Abstract of J. T. Bell's "Arboreal auscultation" (Can. entom., Jan. 1881, v. 13, p. 19-20) [Rec., 2224]. *G: D.* (4491)

Vion, René. Comment les insectes endurent l'hiver. (Bull. Soc. linn. du nord de la France, 1880, v. 5, p. 111-112.)

Notes from Miss E. A. Ormerod's observations, showing that the effect of very severe winters upon insect life is not to destroy the insects, as hes been supposed. *G: D.* (4492)

Vion, René. L'entomologie en Amérique. (Bull. Soc. linn. du nord de la France, 1881, v. 5, p. 312-314.)

Abstract of the account of the meeting of the Entomological section of the American association for the advancement of science, at Boston (Mass.), in 1880, as given in the *Canadian entomologist*, Sept., 1880, v. 12, p. 161-174) [Rec., 2486]. *G: D.* (4493)

Vion, René. Les fourmis à miel. (Bull. Soc. linn. du nord de la France, 1882, v. 6, p. 87-90.)

Abstract of H: C. McCook's "The honey ants of the Garden of the gods" (Proc. Acad. nat. sci. Phil., 1881, p. 17-77, pl. 1-10) [Rec., 4433]. *G: D.* (4494)

Vion, René. Moyen de détruire les nids de guépe. (Bull. Soc. linn. du nord de la France, 1882, v. 6, p. 185-186.)

A mode of killing the wasps in a nest by putting powdered cyanide of potassium [KCN] at the entrance of the nest; a nest so treated contained over 3,400 wasps. *G: D.* (4495)

Vion, René. Résurrection des tardigrades par l'humidité. (Bull. Soc. linn. du nord de la France, 1882, v. 6, p. 27-28.)

Brief résumé of the views held by various authors upon the subject of the restoration of tardigrades after they have been dried, and of the results of experiments on this subject in Jung's "Das wiederaufleben eingetrockneter tardigraden" (Zeitschr. f. d. gesammt. naturw., 1881, v. 54, s. 3, v. 6, p. 190-192) [Rec., 4410]. *G: D.* (4496)

Vion, René. Ruses d'une guépe. (Bull. Soc. linn. du nord de la France, 1880, v. 5, p. 112.)

Abstract of a note by Seth Green (*New York world* . . .) describing how a wasp, by shaking a spider's web, attracted the spider out of it, and then killed the spider. *G: D.* (4497)

V[ion,] R[ené]. La sélection chez les papillons. (Bull. Soc. linn. du nord de la France, 1880, v. 5, p. 15-16.)

Notes from Fritz Müller on the sexual dimorphism of *epicatia acontius.* *G: D.* (4498)

Vion, René. Le sens des couleurs chez les abeilles. (Bull. Soc. linn. du nord de la France, 1882, v. 6, p. 58-59.)

Notice of some of J: Lubbock's experiments upon the ability of *apis mellifica* to distinguish colors. *G: D.* (4499)

Vion, René. Le venin de l'abeille. (Bull. Soc. linn. du nord de la France, 1882, v. 6, p. 186-187.)

Notes on the role played by formic acid [CH_2O_2], in the sting of the bee [*apis mellifica*], and the preserving power which the same acid has in the bees' honey; mention of some other organisms which contain this acid. *G: D.* (4500)

Weyenbergh, Hendrik. Bibliographie scientifique, principalement zoologique, du Dr. H. Weyenbergh. (Periód. zool. argent., 1881, v. 3, p. 329-361.)

Separate, with t.-p. cover. 34 p. 23 × 16, t 16 × 9.6.

Contains a list of 152 papers, many of them upon insects, by Dr. H. Weyenbergh, and a list of the new species of animals described in these papers. *G: D.* (4501)

Young, J: N. Breeding moths in confinement. (Rec. and observ. Rotherham nat. soc., July 1884, no. 1, p. 10-11.)

Account of breeding specimens of *liparis monacha* from the egg; and of failure to continue the breeding without introducing "new blood," that is of males not descended from the same parents as the females. *G: D.* (4502)

ENTOMOLOGICAL ITEMS.

SPHINGIDAE OF NORTH AMERICA. — The American entomological society will issue shortly a monograph of the *sphingidae* of America north of Mexico, by Mr. John B. Smith.

PUPA OF DANAIS ARCHIPPUS.—A paper, by Mr. J. H. Emerton, describing the anatomy of the chrysalis of *Danais archippus* will appear in an early numero of the Memoirs of the Boston society of natural history. A plate will illustrate the paper.

A NEW APPOINTMENT.—Mr. Clarence M. Weed, for some time an assistant of Prof. S. A. Forbes, at Champaign, Ill., has been appointed entomologist to the Ohio agricultural experiment station, at Columbus, Ohio, where all correspondence for him should be addressed.

APHIDIDAE AND THEIR FOOD-PLANTS. — Bulletin no. 4 of the Geographical and natural history survey of Minnesota contains a synopsis of the *aphididae* of the state by Prof. O. W. Oestlund. A list of North American plants with species of *aphididae* known to attack them is added.

A NEW ELEMENTARY ENTOMOLOGY.—Prof. A. S. Packard has prepared an Entomology for beginners, which will be published in June by Henry Holt and company. The book will contain brief descriptions of the principal families of all orders, followed by directions for collecting and preserving insects, a chapter on injurious insects, &c. The work will be fully illustrated.

COLOR-PREFERENCE IN ANTHRENUS.—The following curious note is taken from a paper by John B. Smith, entitled, "Some observations on museum pests" (Proc. Entom. soc. Washington, 1887, v. 1, no. 2), p. 115.

"As a rule *Anthrenus* can hardly be considered fastidious, but occasionally they manifest color preferences. In one specimen of *Grapta interrogationis* the black spots bordering on the costa were neatly cut out, no other portion of the wing being touched. Its career was suddenly cut short before it had quite finished one wing, and I now regret that I did not allow it to continue its work to note whether it would have attacked the other wing in the same manner."

ON THE SEXES OF LEPIDOPTEROUS larvae.— Mr. J. A. Weniger, in an article with the above title, published in the *Entomologist* for April 1887, states that the sex of some of the larvae of *Attacus* can be distinguished, in the later larval stages, by examination of the under side of the last segment that bears stigmata. In the female, on the middle of the ventral side of this segment, there is a dark blotch, in natural size not larger than the head of a pin, and the middle of this blotch has a yellowish tint. In the male the same blotch is present, but its "middle is a dark green spot, which gives the appearance of a hole: this is only from the internal organs, and is a liquid substance; for should a larvae of each sex be killed and emptied, nothing of the signs will remain." Mr. E: B. Poulton, in a note following Mr. Weniger's communication thinks it should be confirmed by further observation, but adds: "It is quite clear that, as Mr. Weniger implies, the markings have not the value of external organs of reproduction, but if their presence is confirmed they will prove to be the blind terminations of the ducts of the sexual glands, which should be found beneath the cuticle at this very spot, as Herold showed, in the case of the larva of *Pieris brassicae*, towards the beginning of this century."

HOUSEHOLD PESTS. — The publishers of *Good housekeeping* (Springfield, Mass.) offer four prizes, each of twenty-five dollars, for recipes or treatment against household pests. The first prize is for an exterminator for the so-called Buffalo-bug (*Anthrenus scrophulariae*), the second for the bed-bug (*Cimex lectularius*), the third for moths, and the fourth for flies and fleas. The mode of treatment will be published in *Good housekeeping*, "and afterwards have a test of merit at the

hands of a committee, composed of three competent housewives, and, upon satisfactory tests being had, cash prizes will be awarded. The treatment in all cases must be safe for handling, and in no way deleterious to the person, texture, or household belongings of any kind."

The notice of these prizes appears in the numero of *Good housekeeping* for 28 April 1888, but no definite time is set for sending in descriptions of competing methods.

COLORATION OF COCOONS AND PUPAE.—In continuation of an item entitled "Mimetic coloration of pupae of butterflies" in the April numero of PSYCHE (p. 48), the following extracts are given, taken from reports, by Herbert Goss, of the proceedings of the Entomological society of London, at the meetings of 2 Nov. 1887, and 7 March 1888, as published in the *Entomologist*, Dec. 1887, v. 20, p. 331-332, and April 1888, v. 21, p. 119.

"Mr. E. B. Poulton exhibited (2 Nov. 1887) the cocoons of three species of lepidoptera, in which the color of the silk had been controlled by the use of appropriate colors in the larval environment at the time of spinning up. Mr. Poulton said this color susceptibility had been previously proved by him in 1886 in the case of *Saturnia carpini*, and the experiments on the subject had been described in the Proc. Royal society, 1887. It appears from these experiments that the cocoons were dark brown when the larvae had been placed in a black bag; white when they had been freely exposed to light with white surfaces in the immediate neighborhood. Mr. Poulton stated that two other species subjected to experiment during the past season afforded confirmatory results. Thus the mature larvae of *Eriogaster lanestris* had been exposed to white surroundings by the Rev. W. J. H. Newman, and cream-colored cocoons were produced in all cases; whilst two or three hundred larvae from the same company spun the ordinary dark brown cocoons among the leaves of the food-plant. In the latter case the green surroundings appeared to act as a stimulus to the production of a color which corresponded with that which the leaves would subsequently assume. Mr. Poulton further stated that he had more recently exposed the larvae of *Halias prasinana* to white surroundings, and had obtained a white and a very light yellow cocoon—far lighter than the lightest of those met with upon leaves. The larva which spun the white cocoon had previously begun to spin a brown one upon a leaf, but upon being removed to white surroundings it produced white silk. Mr. Stainton suggested that larvae should be placed in green boxes, with the view of ascertaining whether the cocoons would be green. He understood that it had been suggested that the cocoons formed amongst leaves became brown because the larvae knew what color the leaves would ultimately become. Mr. Poulton said he felt convinced that the whole process was entirely involuntary, and that the susceptibility had arisen through the action of natural selection."

"Mr. W. White read (7 March 1888) a paper on 'Experiments upon the color-relation between the pupae of *Pieris rapae* and their immediate surroundings,' which comprised a detailed account and discussion of a series of observations carried on, at the author's instigation, by Mr. G. C. Griffiths, of Bristol. The various experiments were intended to act as a further test of the conclusions arrived at by Mr. E. B. Poulton in his paper on the subject recently published in the Transactions of the Royal society; and to effect this object different and additional influences had been brought to bear on these pupae, so that an analogy might be drawn between the two sets of results."

The above notes are given in full, in the hopes that American breeders of insects will try experiments in this direction. The expense, both of time and money, in carrying on this kind of experimenting is little, while the results, if the work is carefully done, are very valuable contributions to physiological knowledge. *G. D.*

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CONTENTS:

ADVERTISEMENTS 62
THE NATURAL HISTORY OF ANOSIA PLEXIPPUS IN NEW ENGLAND — *Samuel Hubbard Scudder* 63–66
SYNOPSIS OF NORTH AMERICAN CICADIDAE — *Charles William Woodworth* . . 67–68
PROCEEDINGS OF SOCIETIES — Cambridge Entomological Club 69–70
ENTOMOLOGICAL ITEMS 71–72

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INDEX TO ENTOMOLOGICAL LITERATURE.

Having accumulated an immense stock of references to the literature of entomology, I will furnish references on special subjects at ten cents each reference, or fifty cents per decade. For further particulars see PSYCHE for Oct.-Dec. 1884, v. 4, p. 223.

B: PICKMAN MANN,
Washington, D. C.

LIBRARY OF THE CAMBRIDGE ENTOMOLOGICAL CLUB.

The librarian of the Cambridge Entomologica Club calls attention to the desirability of preserving in the library of the Club as complete a series of entomological publications as it is possible to collect. It is especially desirable to preserve the transient literature of the subject—separates, small pamphlets and newspaper articles—and the librarian will be pleased to receive single copies of the daily papers, scientific journals, magazines, or agricultural papers, which contain entomological articles. These papers are preserved and catalogd, and, because they are overlooked by large general libraries, are just the kind of material that should be preserved in a special entomological library. Any one who has sought for some of the best of the agricultural journals of the western states in libraries will appreciate any effort made to preserve journals of this sort.

Separates which are often thrown into the waste-basket, as useless, as too small for preservation, as duplications of parts of serials, or as valueless, are respectfully solicited. The friends of the Club are also asked to send a copy of newspapers in which they have published articles or notes on entomological subjects. If these notes are anonymous, the author's name will be acceptible information.

The accessions to the library of the Club had reached the number of 1643 at the end of last year (1887).

Direct all papers for the library to

CAMBRIDGE ENTOMOLOGICAL CLUB,
Cambridge, Mass.

PSYCHE.

THE NATURAL HISTORY OF *ANOSIA PLEXIPPUS* IN NEW ENGLAND.

BY SAMUEL HUBBARD SCUDDER, CAMBRIDGE, MASS.

This butterfly passes the winter in the imago state. In southern latitudes, according to Edwards, who has given it closest attention, it appears early in the spring and lays eggs upon the milkweed just out of the ground, beginning in West Virginia in the early part of May. The insect matures there very rapidly, and passes through several generations, according to Mr. Edwards at least three, and probably four, in the course of the season, the latest brood of the butterflies hibernating. Riley, who was the first to give a tolerably full life history of the insect, claimed that in Missouri it was double-brooded, the broods appearing in the latter half of June and in October. In New England, however, what we can learn of the butterfly indicates a somewhat different history. Some years ago, in publishing an account of its history here, I claimed that the insect was only single-brooded, first coming out of hibernation at the end of June and early in July, laying eggs for a month or so, and the butterflies from these eggs hibernating. A great many points concerning its history both here and elsewhere have been brought out since then, and the facts as we know them at present may probably be interpreted somewhat in this way.

The butterflies, which are far more numerous in the late autumn than at any other time, seek winter quarters to hibernate, but with very rare exceptions, north of the natural division line of the Canadian and Alleghanian faunas, and even to a considerable distance to the south of this, possibly sometimes throughout the entire district of New England, every single specimen perishes. Now and then an old and battered female may be found in the month of May, but we have actually on record as far as I can discover but two or three instances of this, and one of these is not specific. A female much worn and faded was found May 12 at Amherst by Professor Parker, and in another year the butterfly was found by Mr. W. D. Marsh on May 15 and May 21 at the same place; while Mr. Caulfield speaks in general terms of the appearance of butterflies in Montreal in May. In the

extreme southern portions of New England and the neighboring districts, we have not infrequent appearances of hibernating butterflies early in May. But neither hibernators nor their progeny, in the preparatory stages — the only absolutely certain proof of an early brood, — are with possibly rare exceptions to be found in the northern half or more of New England either in May or early in June. The first occurrence of the insect there in any form is much later in the season, generally by the middle of June, occasionally by the very first, sometimes not until the very end of this month, when fine fresh butterflies make their appearance, at about the same time as, or a trifle later than, the advent a little further south of the first fresh brood of butterflies from eggs of the same season,—thus giving all the appearance throughout New England of an identical swarm of butterflies, varying in time from those found next the southern borders of New England only so much as would be expected from latitude.

This brood is in my opinion to be accounted for only on the supposition that they are *colonists from the south* which have flown to more northern districts from that impulse to wander which is one of the psychological characteristics of this butterfly. This hypothesis is further supported by the essentially tropical nature of the butterfly, which would prevent its establishing itself as a permanent resident rather than as an annual visitor of northern districts; by its well-known vast power of flight; as well as by its comparative history in the south. These butterflies begin in New England to lay their eggs usually in the first week in July, but occasionally as early as the middle of June. Dr. Harris records some caterpillars found on the 28th of June which had reached the length of an inch on the 5th of July, and I have found them in Shirley, Mass., of the length of six millimetres, therefore probably in the second stage, on the 22d of June. These were unusually early caterpillars of the brood which had flown from the south and which sometimes makes its advent early in June. Both Mr. F. H. Sprague and myself have found them about Boston as early as the 2d of this month in good condition, and single additional specimens were found in the same year by Mr. Sprague on the 9th and 15th of June. They never, however, become at all abundant before the first week in July, when the eggs are ordinarily laid. The eggs continue to be laid throughout this entire month without any interruption.

As regards the later history of this butterfly in the north, we are still somewhat in doubt. Mr. Edwards urges with great pertinacity that the behavior of the butterfly in the north is altogether parallel to its behavior in the south, but this would hardly seem as yet to be settled; at any rate the appearance of the latest fresh butterflies of the season may easily be accounted

for on the supposition that they were produced from eggs laid by the older females of the first brood of colonists. For the observer will notice that eggs are laid by butterflies both in a fairly fresh condition and also by those which have been upon the wing a long time, and the closest observations I have been able to give through many summers both of butterflies seen in the act of depositing their eggs and of the contents of the ovaries of others, lead me strongly to the conviction that this butterfly requires more than a brief time for oviposition, the eggs maturing by degrees and not being fully laid until the butterfly has been upon the wing about an entire month. The examination of butterflies fresh from the chrysalis shows that the eggs are never entirely mature at this time, while on the other hand these butterflies retain their freshness of appearance for a longer time than usual after they have come from the chrysalis. That there is easily time for a second brood of butterflies from eggs laid by the progeny of the first colonists (basing our judgment upon the facts as given us by Mr. Edwards in the south), there can be little doubt, but the proof of such a second brood has yet to be given. While, therefore, I am compelled by the facts that have been advanced since my former account of this species was published to modify my views in one respect, I am still inclined to think it in the main correct, viz., that this butterfly is normally single brooded throughout the larger part of New England; but that it requires an annual visitation of colonists from the south to exist at all, the hibernating butterflies perishing annually, almost to an individual.

Mr. Edwards entertains a different opinion regarding its life history in New England and does not believe that the butterflies which have hibernated perish to any such extent as I have presumed; and, because single instances of hibernating butterflies have been found in Massachusetts, he considers that "this settles the matter." But he fails to mention the fact that during the year 1887 when one observer found two of these hibernating butterflies in May at Amherst, this observer (Mr. Marsh), who was constantly on the watch for this butterfly, discovered but these two specimens in the season, while a number of Mr. Edwards' New England correspondents, whom he had similarly put upon a special search, were unable to find any; nor does he take note of the fact that Amherst, the only place in which these hibernating butterflies have yet been found in so northern a latitude as Massachusetts, is in the Connecticut valley, where the isotherms trend northward; and which is but a comparatively short distance north of those parts of southern Connecticut, in the valley of the same river, where it is not improbable that successfully hibernating butterflies may be found in all favorable years; nor is he perhaps aware that the valley of this river is one in which southern butterflies find their way far-

ther north than at any other point in New England excepting in some instances along the sea-board.

My own collecting in New England, where this butterfly is much less common than further south, leads me to believe that it is far easier to obtain it by search for the caterpillar on the leaves of *Asclepias* than by capture upon the wing; and I should rather decide upon the presence of butterflies in any particular district by a search for plants of *Asclepias* in suitable spots, than by watching for the butterflies; so that the failure year after year to find such larvae on young and tender plants in the very spots which are invariably chosen by the July butterflies whereon to deposit their eggs is to me very strong proof that the butterfly does not ordinarily exist in any form during the early months of the year in regions that I have searched. Regarding the later broods it may be added that the observations of Mr. Marsh, who raised butterflies as late as the latter half of October and even in November, were made in part at least upon housed larvae and that at this late epoch of the year the transformations of the insect are very much slower than they are earlier in the season. Thus Mr. Marsh himself states that the pupal period in October is about three weeks, while in September it is only about a fortnight. In midsummer it is about ten days.

Mr. Edwards, accepting a suggestion of Mr. Marsh, further urges that the failure to discover the hibernators in the spring is due to their rarity in the autumn and the latter from the fact that in New England the fields are often mowed for a second crop and that with the hay great quantities of milk-weed are cut down. But aside from the fact that the larger part of the milk-weeds inhabited by the caterpillars is found by the side of roads and lanes and in close vicinity to shrubbery, where it is not disturbed by the scythe, there is a single fact which renders this argument absolutely useless, viz., that the imago is far more abundant late in the season than at any other time in the year, sometimes swarming to an excessive extent and found in New England in the same abundance that it is so often found in the west. Yet so far as I have been able to find from inquiries (unfortunately not made at the time), in no instance have hibernators been seen in years immediately succeeding autumns which have witnessed a vast profusion of butterflies, nor have autumns of great abundance been followed by springs of plenty.

SYNOPSIS OF NORTH AMERICAN CICADIDAE.

BY CHARLES WILLIAM WOODWORTH, CAMBRIDGE, MASS.

The following synopsis will enable one to easily distinguish our North American species.

GENERA.

A. Second abdominal segment of the male expanded and partly or wholly concealing the tympanum.

B. Side margins of the thorax expanded horizontally. *Zammara.*

BB. Side margins of the thorax not horizontal, hardly expanded.

C. First apical crossvein oblique.

D. Basal cell of anterior wing less than twice as long as broad. *Cicada.*

DD. Basal cell of anterior wing twice as long as broad. *Tettigia.*

CC. First apical crossvein forming right angles with the principal veins. *Proarna.*

AA. Second abdominal segment of the male not expanded. Tympanum free or wanting.

E. Ulnar veins separate and distinct at base.

F. Tympannum present *Tibicen.*

FF. Tympanum wanting, wings rather shorter and broader than usual, cells wide. *Platypedia.*

EE. Ulnar veins united at base. *Melampsalta.*

SPECIES.

Zammara Am. & Serv.

smaragdina Walker.

angulosa Walker.

San Diego, California; also Mexico.

Cicada Linn.

a. Opercles rounded behind in both sexes.

b. Wings unclouded except at the crossveins.

c. A median dorsal row of white spots on the abdomen above. *dorsata.*

cc. No dorsal white spots on the abdomen.

d. Male genitals broad, median dorsal spine generally short, blunt, or wanting. Anterior prothoracic spots generally separated from the others. *marginata.*

dd. Male genitals narrow, median dorsal spine generally large and acute. Anterior prothoracic spots always united with the others. All generally forming a broad V-shaped spot. *tibicen.*

bb. Wings clouded at their tips, body green marked with black. *superba.*

aa. Opercles white, pointed behind in both sexes. *albipennis.*

dorsata Say.
robertsoni Fitch.
On the prairies, Illinois to Texas.
marginata Say.

aurifera Say.
auletes Germar.
resh Haldeman.
bicostata Walker.
New Jersey to Utah, and southward to Mexico.

tibicen Linn.
opercularis Olivier.
pruinosa Say.
lyricen DeGeer.
canicularis Harris.
All the United States east of the Rocky Mountains, and also southward to Brazil.

superba Fitch.
Arkansas, Indian Territory.

albipennis Say.
Arizona.

Tettigia Kol.

hieroglyphica Say.
characteria Germ.
johannis Walk.
sexguttata Walk.
New Jersey southward to Mexico.

Proarna Stål.

championi Distant.
Texas, Mexico.

Tibicen Latr.

a. Head much narrower than the thorax.

b. Expanse of wings 40 mm., markings yellow. *synodica.*

bb. Expanse of wings 60-70 mm., markings brown or brownish yellow. *rimosa.*

aa. Head nearly as wide as the prothorax. *septendecim.*

synodica Say.
Illinois, Colorado.

rimosa Say.
hesperina Uhler.
striatipes Hald.
noveboracensis Emmons.
occidentalis Walker.
All the northern part of the United States, and in Canada.

septendecim Linn.
cassinii Fisher.
tredecim Riley.
Eastern part of U. S. as far north as New York and Michigan, and west to Colorado.

Platypedia Uhler.

areolata Uhler.
putnami Uhler.
Colorado to California.

Melampsalta Kol.

parvula Say
pallescens Germ.
Southern states, as far north as Ga., Ill. and Kansas.

PSYCHE.

CAMBRIDGE, MASS., JUNE 1888.

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Works on subjects not related to entomology will not be reviewed in PSYCHE.

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PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

(*Continued from p. 56.*)

14 MAY 1886.—The 120th meeting was held at 61 Sacramento St., Cambridge, 14 May 1886. In the absence of the president, Mr. P. S. Abbot was chosen chairman.

Mr. S: H. Scudder showed wood-cuts from Miall and Denny's work "The structure and life-history of the cockroach," and exhibited impressions from the different plates used in printing the plate of *pierinae* in his own work on New England butterflies. These impressions illustrated in a clear manner the process by which the figures are toned to their right color.

Mr. R. Hayward exhibited specimens of the species of *Nebria* collected by him in southwestern Colorado during the past summer (1885) and remarked briefly on their distribution and relative abundance. Among the species obtained were *N. ovipennis* (?), *N. purpurata*, *N. obliqua*, *N. trifaria* and others. The specimens referred to *N. ovipennis* were all found at altitudes above 10,000 ft. Many specimens of *N. purpurata* were obtained from under the bark of logs which had been washed down by a tributary of the Gunnison river.

Mr. F. S. Child showed two specimens of a species of *Cassida* from the cave of Elephantine, India.

Mr. G: Dimmock exhibited a case of some insect or spider, which had been found on a tree. It was made of grass and had a perfect lid.

11 JUNE 1886.—The 121st meeting was held at the secretary's room, No. 36 Grays, Cambridge, 11 June 1886. In the absence of the president, Mr. S: H. Scudder was chosen chairman.

Messrs. S: H. Scudder and R. Hayward, remarked briefly on a collecting trip, which they had recently made to the White Mts., N. H.

Mr. S: H. Scudder stated that he was fairly confident of having seen *Chionobas semidea* near the summit of Mt. Washington. The species has not been previously noted earlier than the first week in July, and if the supposed specimens of *C. semidea* belonged in reality to that species, it would seem that there must be two broods in a season.

8 OCT. 1886.—The 122d meeting was held at 61 Sacramento St., Cambridge, 8 Oct. 1886. In the absence of the president, Dr. G: Dimmock was chosen chairman.

Mr. J. H. Emerton exhibited a figure of a male and female pink grasshopper (a variety *Amblycorypha oblongifolia*), which he had drawn for Mr. S: H. Scudder.

Mr. S: H. Scudder remarked at some length on this variety. The first recorded specimen of abnormally red locustarian was taken in the mountains of Pennsylvania, but belonged to a distinct species, *A. rotundifolia*. Four specimens of the red form of *A. oblongifolia* were taken during the past summer at Woods Holl, some of which were seen by Mr. Scudder while alive. They ate golden rod (*Solidago*) with avidity. Mr. Scudder has been looking up the bibliography of the subject, in hopes to remark further upon it at a subsequent meeting of the club. Brunner von Wattenwyl records a specimen from Pennsylvania with violet elytra, and also mentions a dimorphic form of

the neighboring genus *Scaphura* from Brazil. It has been suggested that since chlorophyll is found in certain insect tissues, the color might be changed by frost, but this could not have been possible in the Woods Holl specimens, as they were found too early in the season.

Mr. J. H. Emerton exhibited figures of the eggs of diurnal lepidoptera, which he had drawn for Mr. S: H. Scudder, a figure of the micropyle of a species of hesperid, and figures of the larvae of various butterflies.

Mr. S: H. Scudder showed a figure of the pupa of *Feniseca tarquinius* and remarked at some length on the habits of this interesting species. The chrysalis has a curiously expanded cremaster. The larva differs very much from those of other copper-butterflies with which it has been placed, by having large protruding legs and a scarcely retractile head, while in its earlier stage, according to Mr. W: H. Edwards, it is completely cylindrical, and in no way onisciform. The egg is not pitted, but only possesses polygonal marking.

Dr. G: Dimmock asked if there had been any study of the mouth-parts of the larva of *Feniseca*, with reference to any modification for its insect food.

Mr. J. H. Emerton exhibited a drawing of a wasp in the act of eating a fly. [See PSYCHE, May 1888, v. 5, p. 54.]

Mr. C: W. Woodworth stated that the only wasps that sleep with their mandibles grasping upon grass or sticks were males of *sphegidae*.

Mr. S: H. Scudder showed eggs of *Argynnis idalia*. Most of the eggs were laid upon the lace with which the butterflies had been covered during transportation, and not upon the violet leaves which had been placed with the butterflies. Some of the eggs were laid upon the lace while in the cars, the butterflies being in a dim light under a seat. All the eggs were pushed through by the ovipositor of the female so as to stand on the outside of the lace.

9 APRIL 1886.— The 119th meeting was held at 61 Sacramento St., 9 April 1886. In the absence of the president, Dr. G: Dimmock was chosen chairman.

The additions to the library were announced by the librarian.

The secretary stated that a reply had been sent to the invitation to attend a celebration of the fiftieth anniversary of the foundation of the Verein für naturkunde zu cassel.

Nominations nos. 136-142 were acted on and the following persons elected to Active membership: Prof. T: J. Burril, Champaign Ill: W: H. Garman, Champaign Ill: Clarence M. Weed, Champaign Ill: C: A. Hart, Champaign Ill: T: F. Hunt, Champaign Ill: Prof. C. Robertson, Carlinville, Ill: C: W: Woodworth, Champaign Ill.

Mr. S. H. Scudder spoke of a recent paper by Dr. Paul Oppenheim of Berlin upon fossil lepidoptera, in which new light was thrown upon some hitherto insufficiently known fossils from Solenhofen which had been referred to hemiptera, lepidoptera and hymenoptera. Dr. Oppenheim claimed, and apparently with some reason, that they should be referred to a distant archaic type to be considered the progenitors of lepidoptera. Two new Jurassic forms were described from Siberia which should probably be referred to the same archaic type, though looked upon by Oppenheim as true lepidoptera.

The Club then visited the laboratory of Dr. Dimmock, who showed his apparatus for rearing insects in constant increased temperature. He also showed some specimens of *Hippodamia convergens* which had been thus reared, and remarked on the difference in time of development and the variations caused by this artificial method of rearing. He further remarked on observations he had made as regards the time of appearance of the spots in various species of *coccinellidae*.

Prof. Alpheus Hyatt said that he had been much interested in Dr. Dimmock's experiments on the acceleration of development, as it has a close bearing on his own studies.

ENTOMOLOGICAL ITEMS.

OMISSION.—Owing to the length of our leading articles the Bibliographical record will be omitted from this numero of PSYCHE.

MR. C: H: T. TOWNSEND has gone from the War department, Adjutant general's office, to the U. S. Department of agriculture, Washington, D. C., which is his present address.

PLATYPSYLLA SURELY COLEOPTEROUS.—Drs. G: H: Horn and C: V. Riley, working independently, have studied the larva of *Platypsylla castoris*, and state that the larval characters fully prove that the insect is coleopterous.

DR. G: H: HORN visits Europe again this season. The Doctor needs this recreation and we know he will bring back with him fresh energy that will enable him to continue his valuable work. His address will be: Care of Dr. D. Sharp, Shirley Warren, Southampton, England. The Doctor will leave May 9th and will be gone all summer.—*Entom. americana*, May 1888, v. 4, p. 36.

A CURIOUS MITE.—A species of *hydrachnidae*, found by Dr. Otto Zacharias in a little mountain stream, the Iser, in northern Germany, and known, on account of its large dermal glands, as *sperchon glandulosus*, has been found lately in the fresh waters of the Azores, by Prof. Barrois, of Lille, France. Dr. Zacharias calls attention, in the *Monate liche mittheilungen aus dem gesammtgebiet-der naturwissenschaften* (Dec. 1887, jahrg. 5, p. 215), to the curious fact that in both these distant localities this species is found only in such ponds and streams as have a temperature of 15-15.5° C.

ANT-INHABITED PLANTS.—Hernandez, about the middle of the seventeenth century, described the stipular thorns of *Acacia cornigera* of Central America, into which certain ants eat, feed upon the pulpy interior, and live in the dwelling thus made. Such inhabited thorns grow larger and distorted, and the ants seem to pay for their hospitality by protecting the tree from other marauding insects. Two woody *Rubiaceae* of Sumatra were described in 1750 by Rumphius, as inhabited by ants. They are both epiphytic and attached to the host tree by a large tuberous base, which is cavernous and occupied by ants. The ants, by their irritating presence, cause the tuberous growth to enlarge, but the enlargement begins during germination before the ants attack it—an instance of a plant preparing beforehand for expected guests. It is said that seedling plants which fail to become inhabited, perish. Dr. Gray, in a review, says that "it is most supposable that this extraordinary formation was acquired gradually; that the normally fleshy caulicle of the ancestral plant, made a nidus for an insect, developed under the disturbing stimulus somewhat as a gall develops, until at length, the tendency became hereditary, and the singular adaption of plant to insect was established."—*Botan. gazette.*

PHOTOGRAPHS OF COBWEBS. Mr. Horace P. Chandler of Boston has made a very successful photograph of an *Epeira* web by taking it early in the morning while it was covered with dew. A copy of this photograph is in the collection of the Boston Society of Natural History. The web hangs between the branches of a spruce tree and looks like that of *Epeira triaranea* though unfortunately the spider was not preserved for identification.

Amateur photographers can render good service by further experiments in this direction, taking care, each time, to preserve the spider in alcohol with a complete record of time, place and surrounding.

The following webs are good subjects for photography and often hang in convenient places: all the flat, round webs made by *Epeira* and its allies the web of *Linyphia marginata*, which consists of a flat dome three or four inches in diameter, held up by an irregular mass of web, extending upward

into the bushes sometimes a foot or more; also that of *L. communis* which consists of two sheets of web slightly curved downwards and supported in the same way by an irregular mass of web; several species of *Theridium* spin a web consisting of a little tent surrounded by irregular threads under branches of trees; the triangular web of *Hyptiotes cavatus* among the dead lower branches of pine trees; the small webs of *Dictyna* on the ends of dry weeds, and those of *Agalena naevia*, flat on grass with a tube leading out from one corner.

James H: Emerton.

FATAL SPIDER BITES.—The following is extracted from Mr. J: B. Smith's report of the meeting of the entomological society o Washington, for 1 March 1888, as given in *Entomologica americana* (May 1888, v. 4, p. 40):

"Prof C: V. Riley presented a paper entitled, 'A contribution to the literature of fatal spider bites,' giving details of a case in which death resulted from the bite of a spider, presumably *Latrodectes mactans*. Also details of another case in which the patient recovered from a bite of the same spider. Prof. Riley reviewed the literature of the subject at some length, and concludes that personal idiosyncacy is a large factor in these cases and that the poisonous secretion of spiders affected different individuals in a very different manner, and hence the discrepancy in results. Mr. Otto Lugger related an experience of his own with *Phydippus tripunctatus*, L., which bit one of his children. The result was convulsions, high fever, headache, swollen eyes and great pain in the pit of the bitten arm. In about three days all inflamation and untoward symptoms had disappeared. Dr. Marx states that the secretion in which *Latrodectes mactans* envelops its victims when taken internally had the effect of increasing the pulse from 72 to 120. He commented on the case, but rather skeptically: he cannot see how *Latrodectes*, with its minute, soft mandibles, can possibly pierce the skin or contain poison enough to produce the violent effects recorded."

VALUE OF PRIVATE COLLECTIONS. — At the end of some sensible remarks in answer to the question "What is the logical *raison d'être* of a collection of lepidoptera?" Mr. F. H. P. Coste, in an article entitled "On collections of lepidoptera" (Entomologist, Apr. 1887, v, 20, p. 93-96), adds:

"I should still advocate the collecting of insects by boys: their time is less valuable, and they find it a delightful amusement, and learn to know all our commoner insects, their haunts, and their classification; whilst, as they grow older, they slide gradually from collecting into scientific entomology. Herbert Spencer says: The practice of breeding larvae, 'when joined with the entomological collection, adds immense interest to Saturday afternoon rambles, and forms an admirable introduction to the study of physiology.'"

Mr. Coste rightly enough concludes that the collection and preservation of insects by so many individuals is a waste of time, from a scientific standpoint, and that much of the knowledge gained from maintaining a large private collection can be obtained as well by visits to a museum.

This abolition of his collection or confining it rigidly to some limited specialty or group of insects would leave the individual free to study particular subjects in entomology, and really to contribute to knowledge, instead of wasting time in pinning, setting and caring for a large collection, much of which is made up of a duplication of specimens found in abundance in museum collections. The application of the principles of division of labor in the work of the entomologist is becoming as important as it is in mechanical work, and the drudgery of preserving large collections ought to be left to museums, where it can be done better and at less real expense than by individual entomologists. *G: D.*

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CONTENTS:

ADVERTISEMENTS 74
ON THE GENUS CICADULA, ZETT — *Charles William Woodworth* 75–76
THE STUDY OF SPECIES AND THE STUDY OF CELLS — *James Henry Emerton* . 77–78
THE MEANS EMPLOYED BY BUTTERFLIES OF THE GENUS BASILARCHIA FOR THE PERPETUATION OF THE SPECIES—*Samuel Hubbard Scudder* . . . 79–85
DESCRIPTION OF THE LARVA OF SPHINX LUSCITIOSA—*Caroline G. Soule* . 85–86
THE ARRANGEMENT OF THE NEW ENGLAND SPECIES OF THANAOS—*Samuel Hubbard Scudder* 86–88
THE USE OF TWO DOORS IN A TRAP-DOOR SPIDER'S NEST—*George F. Atkinson* . 88–89
MATING OF SAMIA CYNTHIA IN CAPTIVITY — *Caroline G. Soule* 89–90
INSECT LIFE 90
BIBLIOGRAPHICAL RECORD NO. 4503—4563 91–94
ENTOMOLOGICAL ITEMS 95–96

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Having accumulated an immense stock of references to the literature of entomology, I will furnish references on special subjects at ten cents each reference, or fifty cents per decade. For further particulars see PSYCHE for Oct.-Dec. 1884, v. 4, p. 223.

B: PICKMAN MANN,
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The librarian of the Cambridge Entomologica Club calls attention to the desirability of preserving in the library of the Club as complete a series of entomological publications as it is possible to collect. It is especially desirable to preserve the transient literature of the subject—separates, small pamphlets and newspaper articles—and the librarian will be pleased to receive single copies of the daily papers, scientific journals, magazines, or agricultural papers, which contain entomological articles. These papers are preserved and catalogd, and, because they are overlooked by large general libraries, are just the kind of material that should be preserved in a special entomological library. Any one who has sought for some of the best of the agricultural journals of the western states in libraries will appreciate any effort made to preserve journals of this sort.

Separates which are often thrown into the waste-basket, as useless, as too small for preservation, as duplications of parts of serials, or as valueless, are respectfully solicited. The friends of the Club are also asked to send a copy of newspapers in which they have published articles or notes on entomological subjects. If these notes are anonymous, the author's name will be acceptible information.

The accessions to the library of the Club had reached the number of 1643 at the end of last year (1887).

Direct all papers for the library to

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PSYCHE.

ON THE GENUS CICADULA, ZETT.

BY CHARLES WILLIAM WOODWORTH, FAYETTEVILLE, ARK.

In the second part of Mr. James Edwards' excellent "Synopsis of British Homoptera" (Trans. Ent. Soc. Lond., 1888, pp. 13-108, pl. 3) it will be seen that the old genus *Cicadula* has been entirely suppressed as it seems without due consideration.

Zetterstedt in his "Insecta Lapponica" (1840) divided the *jassidae* of that region into four genera as follows; *Jassus* corresponding exactly with Mr. Edwards' family *bythoscopidae*, *Cicada* equivalent to *Deltocephalus* of later authors, *Thamnotettix* including the species now placed in the two genera *Thamnotettix* and *Athysanus* and *Cicadula* which corresponds to *Limnotettix*, *Gnathodus* and the *typhlocybini*.

Cicadula was originally divided by Zetterstedt into eight sections which correspond to modern genera as follows:

a. = Limnotettix.
b. = Kybos.
c. = Gnathodus.
d. = Alebra and Dicroneura.
e. f. h. = Eupteryx.
g. = Typhlocyba.

The separation of the *jassini* from the *typhlocybini* was, naturally, the first act of subsequent authors, accordingly Boheman (Nya Sven. Homop. 1845) restricted the *jassini* to *Thamnotettix* and called the rest *Typhlocyba*. In the same way did Flor (Die Rhynch. Livl. 1861) and Kirschbaum (Cicadinen Gegend Wiesbaden 1868) but they substituted *Jassus* for *Thamnotettix*. Marshall (Ent. Mo. Mag. v. 3, 1866) divided them in a similar way but he preferred the name *Eupteryx* Curtis to *Typhlocyba* Germ., and the former really had priority. In 1866 Stål (Hemip. Africana, pt. 4, p. 119) pointed out that *Jassus* was not applicable for European species so it became necessary to make some other disposition for them.

This was an opportune time for the dismemberment of the old polymorphous groups and the formation of more restricted genera, accordingly Fieber undertook this task and in 1866 his "Neue Gattungen und Arten in Homoptera" appeared. In this work the characters used for the separation of the genera were often insufficient so that many more genera were formed than the facts allowed. Fieber himself soon recognized this and in later works (Katalog Cicadinen 1872 and Cicadines d' Europe 1876) tried to rectify, as far as possible, his mistakes. He believed that *Cicadula* should be used for a genus of Jassids, and not of *Typhlocybids*, so he made it one of the four genera into which he divided this portion of the old genus *Jassus*. Two of these genera he made synonyms in a later work but here

he made the mistake of placing one species in *Thamnotettix;* with this exception Fieber places all the species of the old genus *Cicadula* in *Cicadula*, *Gnathodus* and the various genera of the *typhlocybini.*

In 1871 J. Sahlberg (Not. Fen.) differs from Fieber in this assignment of the genus *Cicadula* and apparently because the larger number of the species of Zetterstedt's genus were *typhlocybini* he thought that the restricted genus *Cicadula* should be of that group, so he chose the first species belonging to it as the type, thus sinking Fieber's genus *Kybos*—a proceeding entirely unwarranted and at variance with all rules of nomenclature. Not only did he do this but he also erected a new genus for the true Jassids, notwithstanding that at least two of Fieber's genera had priority over it.

The English hemipterologists, Douglass and Scott (Ent. Mo. Mag. v. 11), and Edwards never countenanced the suppression of *Kybos* but have failed to notice the manner in which Sahlberg substituted his own name *Limnotettix* for the time honored *Cicadula.*

I hold, therefore, that *Cicadula* is the proper name of the genus now called *Limnotettix* and that *quadrinotata* Fabr., must be considered its type.

The following is, I think, the correct assignment of Zetterstedt's species.

a.	1. quadrinotata Fabr.	=	Cicadula quadrinotata Fabr.
	2. strigipes Zett.	=	quadrinotata Fabr.
	3. maculipes Zett.	=	quadripunctata Fall.
	4. sexnotata Fll.	=	sexnotata Fall.
	5. alpina Zett.	=	sexnotata Fall.
	6. septemnotata Fall.	=	septemnotata Fall.
	7. dahlborni Zett.	=	dahlborni Zett.
	8. sulphurella Zett.	=	sulphurella Zett.
b.	9. smaragdula Fall.	=	Kybos smaragdula Fall.
c.	10. punctata Thunb.	=	Gnathodus punctatus Thunb.
	11. spreta Zett.	=	punctatus Thunb.
d.	12. elegantula Dahlb.	=	Alebra albostriella Fall.
	13. citrinella Zett.	=	Dicroneura citrinella Zett.
	14. gracilis Zett.	=	citrinella Zett.
	15. micantulus Zett.	=	micantulus Zett.
e.	16. utricae Fabr.	=	Eupteryx utricae Fabr.
f.	17. vittata Linn.	=	vittata Linn.
g.	18. rosae Linn.	=	Typhlocyba rosae Linn.
	19. lineatella Fall.	=	geometrica Schrank.
	20. sexpunctata Fall.	=	sexpunctata Fall.
	21. 10-punctata Fall.	=	sexpunctata Fall.
h.	22. pulchella Fall.	=	Eupteryx pulchella Fall.
	23. germari Zett.	=	germari Zett.

THE STUDY OF SPECIES AND THE STUDY OF CELLS.

BY JAMES HENRY EMERTON, BOSTON, MASS.

[Annual address of the retiring president of the Cambridge Entomological Club, 13 January 1888.]

During the last few years the study of species has become less and less fashionable among naturalists. New species are still described and old ones better defined. The changes which animals pass through as they grow up are better understood and their habits and distribution better known and explained but all this work is carried on in the face of the opinion of a large body of our most active naturalists that it is not the most proper kind of work for a naturalist to do and might as well be left undone. For this reason many students have felt that they could make no investigations of any value without a laboratory and complicated apparatus of the latest kind and others who have begun valuable sysetmatic studies have felt called upon to waste what they had done and begin again a new kind of study.

This state of things is of special interest to entomologists. The great number of species of insects makes it important that there should always be men who make it their special work to know the species of large groups and who are able to make use of new discoveries in improving their classification and any prejudice that prevents the best young naturalists from beginning early the study of species and getting the knowledge and practice it needs, is one that entomologists above all others should do their best to discourage.

It is hard for us to realize that twenty-five or thirty years ago most naturalists believed that species could not be explained and were for all practical purposes the bottom facts of natural history. The sudden change of opinion on this subject has naturally led to a comparative neglect of the study of species.

At the same time the improvements of microscopes and improved methods of dissection by which each cell in an animal can be separately examined have opened a new field of study which has drawn attention away from older ones.

A student beginning his studies naturally follows that line which is most popular or most novel at the time. He sees the latest books filled with discoveries in that direction, his teachers are helping to make those discoveries and he sees in doing the same thing the best prospect of success in his profession.

I would not undervalue in any way the microscopic anatomical work now so popular with students, but only the prejudice which leads them to believe that it is something different from and superior to the study and classification of whole animals.

The study of species has for its object to improve their classification, that is to measure their resemblances and

differences and in this way try to explain why they differ from each other and why some kinds exist instead of others that might have existed.

The study of microscopic anatomy attempts the same thing with smaller objects. It compares cells together and classifies them into layers and tissues and so tries to explain the cause of their differences and why they combine together some into one organ and some into another.

In the study of species there is use for all the facts that can be found. It is true our classifications of most animals is based on a very superficial knowledge of them but this is because the number of animals is so great that there has not been time to know more. There is no prospect of everything being known about any one animal and our classifications and theories must be made to suit the facts as they are and then improved as knowledge increases.

It has often been urged against the study of species that is largely a study of names, and students have turned to histology or embryology hoping to avoid this and accomplish more with the same labor. This may have been possible once but any embryological or histological book of the present time has as large a part devoted to the meanings of words and interpretations of the descriptions of other writers on the same subject as any book on classification, nor is there any reason to believe that the proportion of space thus devoted to synonymy will decrease.

The classification of species is largely based on specimens which are kept in museums more or less public and it is often possible for persons interested to compare them with what has been written about them and the importance of preserving such type specimens is generally recognized.

The type specimens of microscopic studies are generally kept by individual students and are small and easily destroyed so that the facilities for comparison are small.

Thus the mistakes of systematic natural history are more easily seen and the difference between good and bad work understood by a large number of persons while the mistakes of microscopic observations are hard to find and so supposed to be rare.

The students of the present day can therefore go on describing new cells with the same freedom with which those of the past generation described species leaving to those that come after them to correct and explain what they have written. With increase in the number of students this advantage is passing away and the histologist will soon have to spend as much labor in identifying what he finds as the student of species.

When the attractions of a new study are gone we shall see that, except in the size of the object studied these two lines of work differ but little and one is as likely to gather valuable facts and new theories as the other and that in either field the value of the work depends only on the care and skill with which it is done.

THE MEANS EMPLOYED BY BUTTERFLIES OF THE GENUS BASILARCHIA FOR THE PERPETUATION OF THE SPECIES.

BY SAMUEL HUBBARD SCUDDER, CAMBRIDGE, MASS.

The power of reproduction conceded, the universal instinct for self-preservation is the fundamental and controlling principle by which the perpetuation of any kind of animal is successfully reached. The uncontrollable maternal instinct of self-sacrifice existing in some animals alone overmasters it, and this exists only in the higher animals, which, compared with the great mass, are but few in number; and is then in most cases called into play only when the creature's life-work is nearly finished. No such instinct occurs among butterflies, nor is in any way likely to be found, so that "self-preservation" and "perpetuation of the species" are here, at least through all but the closing days of life, practically equivalent terms. The "struggle for existence" in the species and in the individual are largely convertible terms.

This struggle is the perpetual inheriance of the individual. The individual inherits alike its structure and its habits of life, which latter are very largely, perhaps almost absolutely, dependent on its structure; its tastes and its propensities, its fears and its devices to circumvent its enemies; all its instincts, which are to a great extent, possibly wholly, the entailment of ancestral habits; its very attitudes, whether at rest or in motion. Its advantages and its disadvantages are thus alike its legacy; so too the peculiar means it employs to disembarrass itself of these disadvantages. This is especially and more immediately true of the insect in its earlier stages, where freedom to change the immediate surroundings is exceedingly limited or altogether impossible, except so far as there is foresight, or an instinct marvellously akin to foresight on the part of the creature in an antecedent stage.

It is of more than usual interest to study the means of self-preservation in the genus *Basilarchia*, since there is hardly another genus of butterflies where throughout its entire life the insect is apparently so exposed to its enemies. They are all, of their kind, conspicuous objects even to our dull eyes, and more than that they are, with the exception of the chrysalis, always found in unusually conspicuous situations. How then do they manage to escape their keen sighted foes, the birds, or their wakeful, indefatigable, persistent enemies among the insect tribes,—ichneumons, ants, wasps, flies, mites, and spiders?

Take first the egg-stage. Every one who has attempted to rear butterflies knows what immense destruction falls to the lot of any species at this stage in its life. Ants and spiders look on them as delicacies made for their delectation, and there is a whole group of tiny

hymenoptera, almost too small to breathe, one would think, mere specks, which live solely upon insects' eggs, piercing them with their egg-darts, their progeny living imprisoned and feeding on the contents until they have run the cycle of their changes. Some attack whole batches of eggs, laying one egg in each, so that one parasite may destroy the entire brood of one butterfly; others lay their all in one or two eggs, and it is to this class that those belong which sting the eggs of *Basilarchia*. How does *Basilarchia* escape this danger? In the first place, the mother rarely lays more than one egg in one spot or even on one bush, though as many as a dozen or two may occasionally be found, where the butterfly's numbers are great and they are growing as it were imprudent. Then it must be remembered first that —to judge from the latest researches— these parasitic flies must be guided less by vision than by touch; and second, that most insect eggs are laid on the broader parts of the leaf on which the young will feed; it is here that the parasite will range in quest of prey; but the eggs of *Basilarchia* are rarely found except at the extreme tips of leaves, and in addition the leaves of the food-plants concerned are all acuminate, some to an excessive extent, as in some of the poplars and birches. When the parasite has, however, found an egg, it may well be inquired whether she would not be deceived by it. It differs from the eggs of all our other butterflies, in that it is besprinkled with little flexible filaments for all the world like the hairs of some leaves. Or if the clothing of the eggs did not deceive, she might even then find it difficult of attack, for minute as these parasites are, less than half a millimetre long, their bodies would extend across at least three of the polygonal cells which regularly stud the surface of the egg, and which send forth these little filaments at every angle, so that poor bewildered madame must struggle through a weary chapparal before she can attain the barren grounds at the summit and find a spot to readily insert her sting. Yet that she succeeds is only too evident to the collector; the larger part of the eggs obtained in the open field which have fallen into my hands have been parasitized.

This is its but too partial defence against its special enemies. But how about those wandering buccaneers, the ants, mites, and spiders? These labor under the same visual defects as the direct parasites, or sometimes greater ones, and the position of the egg, remote from their usual hunting ground, must serve as no inconsiderable protection; how great, there are hardly means of measurement. Their greatest protection from these savages, which cannot fly but must wander ceaselessly about on foot in search of prey with satanic energy, is undoubtedly in the fewness of their number on one plant. The spider that finds two eggs of a *Basilarchia* in one day must be an excellent hunter.

Escaped at last from these dangers,

which only lasted at the most ten days the caterpillar crawls forth from its prison and begins its active life. It is a scrawny juiceless looking thing, all covered with warts, and less than any other newly born caterpillar, would seem a tempting morsel even to an ichneumon or a spider. Yet both make havoc with it at this time. To a wandering ichneumon contact with an empty egg-shell would probably mean, as a result of its inherited wisdom, that some nice young caterpillar was about, and the neighborhood would be all the more thoroughly ransacked. Caterpillars devouring their egg-shells, and so not leaving this "scent" behind them, would oftenest escape, and by degrees this habit would be perpetuated and fixed; and so it is here; almost invariably the caterpillar hastens to destroy its former prison walls, which it devours to the very base, too closely glued to the leaf to be eaten; probably it breathes more freely when that is done.

But where does it now find itself? Its food at its very feet,—yes; but in the most exposed position possible. Atop the extreme tip of one of the outmost leaves of a spray that projects most freely into the sun and air, just where it can most easily be seen by the passer by; this seems to be the case nine times out of ten. It is, however, probably the safest place from the prowling spiders; but surely not from its flying enemies. What does it do? retreat down the leaf? That would be only to exchange one danger for another, and on its way to a presumed place of safety it would be more sure of detection, because a moving object in nature is alway most easily noticed. No, it eats the nearest bit of leaf down to but not including the midrib, first on one side and then on the other, and then retires to near the tip of the midrib to digest it; subsequent meals it takes in the same way, moving with excessive deliberation along its narrow path and retiring always to the same spot. On this perch it cannot be seen from below, and from the sides and above seems almost or wholly a part of the denuded midrib to which it clings; more particularly when the leaves are in motion by the wind, as they usually are on the trees on which it feeds, particularly in the case of the aspen.

That this mode of life is on the whole an advantage to it is rendered probable from the fact that there are two cases known, in which it is followed very closely by caterpillars of a moth (*Notodonta*), feeding on the very same plant as species of butterflies with this habit (one in Europe and one in America); while the caterpillars of *Basilarchia* employ a further device, the actual import of which has been a puzzle. Very soon after birth, when it has eaten but a very few swaths down the leaf, the little fellow constructs a small and loose packet from minute bits of leaf and other rejectamenta, loosely fastened to one another and to the midrib, close to but scarcely touching the eaten edge of the leaf, and as fast as the leaf is eaten, it removes this packet (continually added to until it becomes about as big as a

small pea), farther and farther down the midrib away from its perch, always keeping it near the eaten edge. It should be noted that it is so loosely attached, the bits of leaf at all possible angles, that it is moved by the least breath. Meanwhile the caterpillar has been growing larger and more conspicuous and thus in greater peril from its enemies. There are two possible services that this odd packet may render. A spider wandering over the leaf and observing its motion may seize it and thinking it has a prize hurry away with it and leave its architect unharmed. This seems to me rather a strained suggestion, for a wandering spider would probably proceed to investigate it on the spot. Another explanation seems more probable. It should be remembered that the leaves preferred by these creatures as food are mostly such as are easily shaken by the wind, and as the caterpillar moves with the leaf and with all the surrounding leaves, in a continual fluttering in the case of the trembling aspen, and to a less degree in the other food-plants, this of itself is a protection to it, as it would more readily escape observation as an object distinct from the leaves, all being in motion together; but on the more stable leaves like the willow and especially the *Rosaceae* and the oaks, the motion in a feeble wind would not be sufficient to be serviceable, and here at least the packet comes into play. An object in motion among others at rest is a most noticeable thing, a fact well recognized among animals, as a host of them show when they fear being seen. This packet attached by loose silken threads moves, as stated, with a breath of wind and so would distract attention from its architect near by, who has taken pains to place it at the farthest remove from its perch, while still (to avoid undesirable steps) on its daily track. If this be really its object, it is surely one of the oddest devices in nature.

The species of *Basilarchia* all pass the winter while in the caterpillar state and but partly grown. The caterpillar has moulted at least once (devouring its cast-off clothing, by the way, doubtless that it may not attract attention) and has to prepare against the inclement season. This it does in a very shrewd way, which is all the more remarkable because no trace or semblance of it is seen in caterpillars of the broods that attain their entire growth in the same season. When the proper time approaches, warned thereto possibly by the dryness of its food, or by the cooler nights, the caterpillar constructs a little nest, sometimes from the still unfinished leaf on which it was born, sometimes from one which it prepares specially at greater pains; this is done by eating away or biting off the unnecessary parts, and leaving on either side of the base of the leaf little flaps just large enough, when drawn together, bottom side up and meeting above, to form a cylinder into which it can squeeze; a projecting shelf is also left beyond the opening, on which it may stand when ready to crawl in, and upon which it may back out in the spring; the whole

of the inside and the upper surface of the shelf are then plastered over with a dense coating of brown silk and the flaps drawn together; more than that, with strangest foresight, the petiole of the leaf is thoroughly fastened to the stem by numberless threads passed carefully and tightly around both; into this cylinder it then crawls head foremost, completely filling the cavity, closing the bevelled hinder opening with the sloping tuberculate and sharpened terminal segments, sure to find itself there when the long night of winter is passed. No, not quite sure, for wasps or some other strong predaceous insects will tear this fine castle open and destroy its single occupant. Whether it is an additional safeguard or not, it is an instructive fact that, at least where the winters are most severe, nearly all these hibernacula are made out of leaves so near the ground that the snow covers them with its warming mantle; and what is more, in certain cases they so closely resemble the winter buds and bursting leaves of the new year that they must sometimes deceive their prowling foes of the early spring.

Shortly after it appears again in the spring and has fed on the tender buds and just opening leaves, it moults again, usually upon the shelf of its hibernaculum but no longer devours its skin, as it quits the immediate neighborhood. It now changes its livery as well and is a most extraordinary looking object, withal very conspicuous. Dark and light green and cream color strive for the mastery and leave it streaked and blotched so that it bears no inconsiderable resemblance, in color at least, to the droppings of some birds, a circumstance which doubtless serves it as some sort of protection. Its body is humped and the bosses bear tubercles which give it a somewhat repulsive aspect; especially a pair a little behind the head are raised aloft thickly studded with prominences, the effect of which is heightened by the creature's habit of arching this part of the body, bending its head to the ground and raising aloft its hinder part, also studded with roughened processes. Altogether it is a rather hideous beast. Then too, if disturbed, it raises the front half of its body from the ground and uses it as a kind of whip-lash throwing it to one side and the other with great violence. When it walks it moves with a slow and cautious tread, its head trembling as if it had the palsy. All this is doubtless to inspire fear to such enemies as might be tempted to attack it, but to how much avail we can hardly tell. It is certainly attacked in considerable numbers by a parasitic hymenopteron, the young of which live within on the juices of the body and escape from the chrysalis when that is formed.

The chrysalis, helpless thing, probably hangs quite exposed upon the stem of the plant which has given the caterpillar nourishment. We know it almost entirely from those raised in confinement. It has an oddly shaped form with a great projection on the back like a Roman nose, and is of a dark green or greenish brown color varied with

cream color, and smooth as if varnished. This makes it appear like a hanging lump of bird dung, and so again must often prevent its being picked off and devoured by some hungry bird.

When one that has at last escaped all the perils of its youth finally reaches its full development, it is even more conspicuous and exposed than before. Although now upon the wing and no doubt often able to escape a pursuer by some quick movement, its natural flight is not swift, and its ordinary movements on the wing are a few quick flutters followed by a sailing motion which is most favorable to capture. Its colors differ of course in the different kinds, and they may in this particular be divided into two classes. One affects a deep rich black blue or blackish purple, and is variegated with light blue and white, the latter partly in the form of bands, on some forming a broad bow across both wings, rendering them most conspicuous and striking objects. They are, too, of a pretty large size, and as they fly mostly in the neighborhood of copses or along shaded roadsides or forest roads, they seem to render themselves by the contrasting back-ground as conspicuous as possible. Another class is of an orange brown color of greater or less depth, while the veins are black, and a black stripe, sometimes accompanied by white dots, crosses the wings. These fly in more open places, more fully exposed to the sun and are scarcely less conspicuous than their fellows. All these butterflies live a considerable time, and indeed the eggs do not mature in the bodies of the females until they have been a fortnight on the wing; and then they do not lay all their eggs at once, or even within a few days, but prolong the operation over many days or even several weeks. To deposit all her eggs therefore, which is the province of course of the female, she must fly amid all the dangers her conspicuous colors offer for about a month, a considerably longer time than the average of butterflies. Previous to egg-laying at least, much of her time is spent upon the ground in company with her fellows, often in great flocks, engrossed in sucking up moisture from the damp earth, from decaying fruits or the droppings of beasts; and so must become a conspicuous and easy prey to her enemies.

What then is to become of this saving remnant of the tribe? How escape from the dangers which it seems to invite? For the individual there would seem to be nothing but chance; but the number of eggs laid under the most favorable circumstances or chances is very considerable; and if only a pair of these finally reaches maturity and is able to fulfil its functions, the number of individuals of the species is maintained. It would seem, however, as if even this chance were small and as if still further protection were needed. And one further protection is afforded, at least to the orange species, in a peculiarity of their life history. Apparently the species of *Basilarchia* are, at least in New England, normally single brooded; but in not infrequent cases, doubtless

more frequent in southern than in northern parts, a second or supplementary brood is formed in one season; as the butterfly lays eggs for some time, and all the females are not born at once, the earliest progeny of the earliest females may not infrequently be able to mature in the same season in time for the production of a second brood. This would seem to be a provision on the part of nature to give the species a better chance. That they need it is perhaps evidenced by the fact that the black-veined orange species, which are almost universally more numerous in individuals than the others, have, in regions where one brood is the normal condition of their fellows, always two broods.

But this is not the only advantage the black-veined orange species have, so that we cannot fairly ascribe their greater numbers to this alone. Their very colors are an advantage to them, for in them they mimic species of *Euploeinae*, which possess a taste and perhaps an odor offensive to birds and other insectivorous animals; the mimicry is very striking indeed, and is the more remarkable from the fact that the northern species resembles the only species of *Euploeinae* found in the region it inhabits, while the southern species as well as the southernmost examples of the northern species, resemble another which is more common in the region they inhabit.

It is indeed possible that one of the normally colored species of *Basilarchia*, one that has least conspicuously contrasted colors, though resplendent with blue and green, is specially protected by the various other devices we have recounted; for certainly it is itself mimicked by one sex of a butterfly of another very distinct group, viz: *Semnopsyche diana*.

DESCRIPTION OF THE LARVA OF SPHINX LUSCITIOSA.

BY CAROLINE G. SOULE, BROOKLINE, MASS.

This larva was found on a poplar shoot, at Sugar Hill, N. H., 21 July 1887.

It was then 18.5 mm. long, slender, and green. The head was triangular, pale green, with a pale yellow stripe on each side. The body was brighter green, covered with white granulations, these being less numerous ventrally.

There were seven oblique lines of pale yellow, edged above with green darker than the body, and the last one extended to the tip of the caudal horn. A clear yellow horizontal line on the first three segments, was continued *very faintly* to the last segment.

The anal shield was of a bluer green than the body, and edged with white.

The feet and props were green; the caudal horn was pinkish above, green beneath, and lined on each side with yellow. Spiracles almost invisible.

The larva moulted on 25 July, and was 25 mm. long and of the same colors and marks as before.

On 27 July faint lines of a reddish color began to appear above the oblique yellow lines.

On 30 July the larva was 44 mm. long, and ate voraciously. The tips of the feet had become red. The yellow stripes on the head had grown very bright.

On 31 July it moulted again, being 53 mm. long.

The mouth parts were black: the yellow face-lines were edged with black; and the caudal horn had a black line on each side instead of a yellow line. Other marks as before.

On 2 August the colors had changed somewhat.

The face-lines had become pale green edged with black — rather faint —; the seven obliques were white edged above with pinkish lilac; the yellow horizontal line had gone from the first three segments, and those segments, as well as the lower half of all the others, were marked with tiny white dots, each encircled with black.

The props had a faint purplish tinge. The spiracles were red.

The head had grown more round, with a slight indentation on top — not enough to call the head bifid.

On 4 August the larva was 62.5 mm. long, and the marks were brighter. The caudal horn was short in proportion to the size of the caterpillar.

On 10 August the length of the larva was 87.5. mm., and the marks were unchanged.

On 12 August it began to be restless, and on 13 August it went into the ground during the night, but re-appeared again on the 14th, though it ate nothing.

On 15 August it had gone into the ground again, and 21 August it had become a bright mahogany-colored pupa, 37.5 mm. long, with a tongue-case 3 mm. in length and lying close against the pupa.

On 7 June, 1888, the pupa had grown much darker and duller, and on 10 June, at about 8.30 A.M., a fine ♀ emerged.

The larva was fed entirely on poplar.

I had netted a ♂ imago in a field near the poplar where I found this larva, only a few days before, flying at almost noon, and feeding at kale blossoms.

THE ARRANGEMENT OF THE NEW ENGLAND SPECIES OF THANAOS.

BY SAMUEL HUBBARD SCUDDER, CAMBRIDGE, MASS.

An examination of the androconia concealed in the costal fold of the fore wing in the species of this genus has brought to light some very curious facts, showing how closely related, as far as these scales are concerned, some of the

species are to each other and how very distinct some that were supposed to be doubtfully separable. This has led to some further examination of the eccentric abdominal appendages of the males, and to a new arrangement of the groups proposed by Mr. Burgess and myself (Proc. Bost. Soc. Nat. Hist., v. 13, p. 282-306, pl.) when we first described these organs. The following table brings out the more striking features and arranges the New England species in a more logical order than before. Ausonius, a somewhat anomalous species, is included in the list as found upon the confines of New England. The only known specimen having been only partially examined (Mr. Lintner kindly permitted me to remove enough scales to study the more prominent characteristics), such features as it is only presumed to have in common with its nearest ally, are placed in brackets.

A. With subapical white spots on fore wings. Terminal hooks of upper organ of ♂ genitalia separate; blades of clasps very long, especially on left side, when compared to the main body. Costal fold furnished with long pediform bristles, curving at base, but with no thread-tipped tapering scales, or apple-seed shaped scales, or twisted ribbons.

I. Species of smaller size. Upper organ of ♂ genitalia without a crest; tooth of same reduced to a bristle; basal process of left clasp unarmed; the blade very slender. Costal fold with many long rod-shaped scales ending in two minute points.

a. Processes of left clasp of ♂ genitalia almost as slender as the blade. The smaller boat-shaped scales of the costal fold often no more than twice as long as broad.....*lucilius*.

b. Processes of left clasp much broader than the blade. The smaller boat-shaped androconia rarely or never so short as above.....*persius*.

II. Species of larger size. Upper organ with a distinct prickly crest; tooth well developed; basal process of left clasp armed with spinules; the blade moderately slender. Costal fold with no 2-pronged rod-like scales and the different species of this group show no distinction in androconia.

a. Crest of upper organ of ♂ genitalia slightly elevated and bearing a vertical shield expanding apically; lobe of right clasp dactylate, curving inward.....*juvenalis*.

b. Crest strongly elevated and surmounted by a horse-shoe shaped ridge; lobe of right clasp greatly expanded, broadest apically.....*horatius*.

c. Crest forming a gibbous prickly protuberance; lobe of right clasp greatly expanded, broadest basally.....*terentius*.

B. With or without subapical spots. [Terminal hooks of upper organ separate]; blade of clasps moderately long as compared to the main body. [Costal fold furnished with long pediform bristles, curving at base, and apple-seed shaped scales, but with no thread-tipped tapering scales nor twisted ribbons].

a. With subapical spots. Right clasp with a slightly prominent median denticle; beyond the bend moderately produced.....*martialis*.

b. Without subapical spots. Right clasp with a somewhat prominent median denticle; beyond the bend much produced.....*ausonius*.

C. No subapical spots. Terminal hooks of upper organ consolidated and stout; blades of clasps very short when compared with the main body. Costal fold furnished with thread-tipped tapering scales or twisted ribbons, but with no long pediform bristles, or apple-seed like scales, or 2-pronged rod-like scales.

a. Of moderate size. Blade of right clasp stout. Costal fold with twisted ribbon-like scales.....*brizo*.

b. Of small size. Blade of right clasp slender. Costal fold with thread-tipped tapering scales.....*icelus*.

THE USE OF TWO DOORS IN A TRAP-DOOR SPIDER'S NEST.

BY GEORGE F. ATKINSON, COLUMBIA, S. C.

Certain of the species of *Nemesia*, the habits of which Mr. Moggridge studied, make two trap-doors to their nests, one at the surface of ground at the upper end of the main tube, the other a short distance below at the beginning of a branch tube. Mr. Moggridge supposed the use of the branch and second door was to afford the spider a means of escape when pursued by an enemy. When chased into the main tube, the spider would go into the branch and close the

door; the enemy following, and finding the main tube empty, would leave.* In my studies of the nests and food habits of *Myrmekiaphila foliata*,† I found indications that the main tube was constructed to serve as a gallery for the passage of ants, or other insects, and that the branch was constructed as a real trap, in which the spider awaited the passing of an ant, when it would open the door and catch the insect. The arguments I then advanced, briefly stated, are: 1st, the nests then found were all made in places where ants had underground passages, 2nd, the main tube connected with some of the ant's galleries, 3rd, the trap-door at the surface of the ground had the appearance of being little used, and 4th, one nest had only one door leading into a short tube. This tube opened into the floor of a broad hall of the ant's nest leading into several galleries. Near this broad hall was the opening to the surface of the ground, made by the ants, and through which the spider probably entered the hall to construct her "branch tube" in the floor.

In May 1888, at Chapel Hill, N. C. I found a nest of *Myrmekiaphila foliata*, under conditions which seem to give conclusive evidence that the main tube is intended to entrap unwary insects that they might be "gobbled in" as they pass the door of the branch where the spider remains. The nest was made in a broad foot path, where the clay soil was very hard. I discovered it by seeing the open door. The following day I visited the place with trowel in hand to dig up the spider. I found the door still open. The main tube was about nine inches long, the branch about one inch long and was situated six inches from the surface of the ground. In this I found the spider. The door to the branch was a *cork* door, while that at the surface of the ground was a *wafer* door. It appears in cases where the nest is not made in an ant's nest, that the outer door is set open, thus offering an attractive place for insects that are crawling on the surface of the ground in search of food. They enter the main tube, and as they pass the branch, the door is suddenly thrown open, and to their surprise they are taken captive and made a meal of by the cunning spider.

* Harvesting Ants and Trap-Door spiders.
† Entomological Americana, Oct. & Nov. 1886.

MATING OF SAMIA CYNTHIA IN CAPTIVITY.

BY CAROLINE G. SOULE, BROOKLINE, MASS.

Last winter I received from Nantucket cocoons of *Samia cynthia* and on the 8th of May, 1888, at 11-30 A. M., a ♂ and ♀ emerged and crawled up the side of my pupa-box at the same time. I removed them to a cage to see if they would mate in captivity.

My cage consists of a shallow flower-pot, seven inches in diameter and nearly full of sand; a circle of heavy cop-

per wire six inches in diameter, to which are attached four movable uprights of the same wire; and a piece of netting.

When set the uprights are stuck into the sand at equal distances, supporting the copper ring at about six inches from the top of the flower pot. The netting is spread over this frame and held to the flower-pot by a rubber band, making an airy cage, the top of which is flat, enabling the moths to hang from it. This cage I put on a table in a room with one window partly open.

The two moths were very quiet all the next day, 9th May, but on the 10th the male crawled about the netting, without seeming to notice the female, who was still quiet, only opening and shutting her wings now and then. I set the cage so that the female was nearest the open window but more than ten feet away from it. Soon after nine in the evening the male began to seem excited and to vibrate his wings so fast that they made a dull buzzing sound, loud enough to attract my attention at the far end of the room. I kept a light until eleven o'clock and all the time the male either kept up the buzzing vibration, or crawled over the netting near the female, opening and shutting his wings as if to display them. As soon as the light was out I heard a great fluttering, which stopped before half-past eleven.

The next morning the moths were *in coitu* hanging from the top of the cage, and so remained until 6.30 P. M., when they separated, and for about an hour were very quiet.

I then put the female into a box covered with netting and before 10 P. M. she had laid 159 eggs.

11th	May	she	laid	80	eggs.
12th	"	"	"	40	"
13th	"	"	"	21	"
14th	"	"	"	13	"
15th	"	"	"	10	"
16th	"	"	"	6	"
17th	"	"	"	6	"
18th	"	"	"	6	"

making a total of 341 eggs.

The last eggs were pure white, without the dark spots characteristic of the others. All the eggs were laid before midnight and most of them before 10 P. M. On 19th of May the female died, the male I had let fly on the third day.

Both emitted a rank odor, not unlike that of *Ailanthus*-flowers and I could not perceive that the odor of the female was stronger or different from that of the male though I tested them in separate rooms.

INSECT LIFE. Under this title the United States Entomologist begins the publication of a periodical bulletin to be issued on an average once a month. It will contain brief notes and papers which are not adapted for the annual reports or the special bulletins of the Division. The first numero is dated July 1888 and contains among other interesting matter a complete life-history of the Willow-shoot Saw-fly (*Phyllocecus integer*). Dr. Williston describes and figures *Lestophornus icerya*e a new genus and species of *Oscinidae* parasitic on the fluted scale (*Icerya purchasi*).

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Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard; S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Adye, J. M. Favourable nights for sugaring, (Entomologist, Mar. 1887, v. 20, p. 66.)

Recommends sugaring in a gale of wind, as he has been most successful on such stormy evenings. *G: D.* (4503)

Barret, C: Golding. *Tinea granella* at King's Lynn [Norfolk, England]. (Entom. mo. mag., Feb. 1888, v. 24, p. 212-213.)

Mode of pupation and other habits of *tinea granella*; brief description of its larva. *G: D.* (4504)

Bath, W. Harcourt. Relaxing insects. (Entomologist, Feb. 1888, v. 21, p. 65-66.)

Mode of using benzine and arsenic in connection with moist sand in relaxing insects for setting. *G: D.* (4505)

Bergé, Albert. Résumé d'une note de M. le Dr. Hagen sur l'emploi des bouchons de caoutchouc vulcanisé dans les collections biologiques du musée de Cambridge. (Comptes-rendus Soc. entom. Belg., 1 May 1886, p. 100-101.)

Separate, 2 p., 24 × 16, t 19 × 10.5.

Abstract of H. A. Hagen's "Twelve years' experience with rubber stoppers used in the biological collection of the museum in Cambridge" (Can. entom., Jan. 1886, v. 18, p. 1-4). [Rec., 0000]. *G: D.* (4506)

Blanford, H: Francis. Sound-producing ants. (Nature, 10 Nov. 1881, v. 25, p. 32, 5 cm.)

Notice of rhythmical sounds produced by white ants (*termitidae*). *G: D.* (4507)

Cameron, M. *Lycaena icarus* hermaphrodite (?). (Entomologist, Apr. 1887, v. 20, p. 106-107.)

Note on a supposed hermaphrodite of *lycaena icarus*, followed by some remarks, by R[ichard] S[outh], on the nature of some apparent hermaphrodites in *lycaena*. *G: D.* (4508)

Capper, S. J. *Vanessa antiopa* with white borders. (Entomologist, May 1887, v. 20, p. 135-136.)

Quotes a letter by M. Wurzburger, of Creuznach, Prussia to show that white-bordered *vanessa antiopa* in Great Britain are hibernated specimens that have flown from the continent, and that the larva is never found in England. *G: D.* (4509)

Carrington, J: T. Collecting British clear-winged lepidoptera. (Entomologist, Apr. 1887, v. 20, p. 96-105.)

Notes on different species of British *sesiidae* and their life-history; preceded by a few notes on their capture and rearing and the attraction of females for males; notes on *sesia tipuliformis*, also found in N. A. *G: D.* (4510)

Carrington, J: T. *Pieris rapae* in Canada. (Entomologist, Mar. 1887, v. 20, p. 63.)

Note on diminution of damages due to *pieris rapae* on account of its control by parasites, and mentions sending these parasites from Europe. *G: D.* (4511)

Casey, T: L. Revision of the *stenini* of America north of Mexico. Insects of the family *staphylinidae*, order *coleoptera*. (Phila. 1884, pp. 206, 1 plate.)

Descriptions of 3, 1 new, species of *dianous*, 130, 112 new, species of *stenus* and 42, 36 new, species of *areus* (n. g.). Figures mouth parts and other appendages. *S: H.* (4512)

Cockerell, T. D. A. On melanism. (Entomologist, Mar. 1887, v. 20, p. 58-59.)

Regards humidity of atmosphere the main factor in producing melanism in animals. *G: D.* (4513)

Copineau, C: Remarques sur le sens du goût chez les oiseaux. (Bull. Soc. linn. du nord de la France, Feb. 1887, v. 7, p. 219-221.)

Abstract of G: F. Waters, "[Sense of taste in birds.]" (Proc. Bost. soc. nat. hist., Oct. 1883, v. 22, p. 433-434). *G: D.* (4514)

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The writer has bred *vanessa antiopa* from larvae found in England. *G: D.* (4516)

Dobrée, N. F. A new method of sugaring. (Entomologist, June 1887, v. 20, p. 164-165.)

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How to set lepidoptera to show their under sides. *G: D.* (4522)

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Gillet, Felix. The codlin moth. (1st rept. Board state hortic. comm. Cal., 1882, p. 24-28.)

Notes on *carpocapsa pomonella* and its habits; thinks the introduction of parasites an easy way to check its ravages. *G: D.* (4524)

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Notes the capture of a specimen of *danais archippus* in Oporto, Portugal. *G: D.* (4525)

Hagen, Hermann August. Twelve years experience with rubber stoppers used in the biological collection of the museum in Cambridge. (Can. entom., Jan. 1886, v. 18, p. 1-4.)

Abstract, by A. Bergé, entitled, Résumé d'une note de M. le Dr. Hagen sur l'emploi des bouchous de caoutchouc vulcanisé dans les collections biologiques du musée de Cambridge. (Comptes-rendus Soc. entom. Belg., 1 May 1886, p. 100-101.)

Abstract, by C: Copineau, entitled, "Bouchons en caoutchouc pour les collections d'histoire naturelle." (Bull. Soc. linn. du nord d. l. France, Sept. 1886, v. 8, p. 139-140.)

Details of experience in using rubber stoppers in tubes containing alcoholic specimens of insects. *G: D.* (4526)

Hewett, G. M. A. Ripe plums a bait for insects. (Entomologist, Feb. 1888, v. 21, p. 65.)

Finds that many moths are attracted to ripe plums in the trees where the flies and wasps had feasted during the daytime. *G: D.* (4527)

Hill, T: Preserving insects. (Entomologist, Mar. 1887, v. 20, p. 66-67.)

Mode of using a solution of corrosive sublimate ($HgCl_2$) to preserve lepidoptera from the attacks of museum pests. A note by J: T. C[arrington] is added, in which naphthalin is recommended. *G: D.* (4528)

Horn, G: H: A monograph of the *aphodiini* inhabiting the United States. (Trans. Amer. entom. soc. 1887, v. 14, p. 1-110.)

Tabular separation, descriptions, synonomy and bibliography; 137 species are described including 14 new species of *aphodius*, 6 of *ataenius*, 1 of *pleurophorus*, 1 of *psammodius* and 3 of *aegialia*. *S: H.* (4529)

Horn, G: H: A study of some genera of *elateridae*. (Trans. Amer. entom. soc. 1884, v. 12, p. 33-42).

Synoptic tables and descriptions of the species of *horistonotus, esthesopus, ludius* and *eniconyx* (n. g.) are given; also descriptions and synonymical notes of some species of *aptopus, anchastus, ischiodontus* and *leptoschema* (n. g.) *S: H.* (4530)

Horn, G: H: A study of the species of *cryptobium* of North America. (Trans. Amer. entom. soc. 1885, v. 12, p. 85-106, pl. 1-2.)

Sexual characters, tabular separation, descriptions, synonymy and bibliography. Figures the ventral modifications in the males. *C. anceps*, *c. lecontei* (*carolinum* Lec.), *c. vagum*, *c. arizonense*, *c. vitatum*, *c. ventrale*, *c. propernum* and *c. nactum* are described as new. *S: H.* (4531)

Horn, G: H: *Dinapate wrightii* and its larva. (Trans. Amer. entom. soc. 1886, v. 13, p. 1-4, pl. 1.

Detailed descriptions and figures of the larva and imago of *dinapate wrightii* n. g. et n. sp. *S: H.* (4532)

Horn, G: H: Mr. Charles Wilt. (Trans. Amer. entom. soc. 1886, v. 13, p. 6 Proc.

Obituary notice. *S: H.* (4533)

Horn, G: H. Notes on the "Biologia Centrali-Americana." (Trans. Amer. entom. soc. 1886, v. 13, p. 7-11 Proc.)

Critical and synonymical notes upon the *carabidae cerambycidae* and *bruchidae* described by Bates and Sharp in Biologia Centrali-Americana. *S: H.* (4534)

Horn, G: H: Notes from the museum at Cambridge,. (Trans. Amer. entom. soc. 1886, v. 13, p. 11-16 Proc., fig.)

Synonymical notes upon *coleoptera* contained in the Museum comparative zoology; figures variations of elytral markings of *psoa maculata* and *ps. quadrisignata*. *S: H.* (4535)

Horn, G: H: Notes on the species of *anomala* inhabiting the United States. (Trans. Amer. entom. soc. 1884, v. 11, p. 157-164.)

Tabular separation, descriptions, synonymy and bibliography of 12, 1 new, species. *S: H.* (4536)

Horn, G: H: Revision of the species of *lachnosterna* of America north of Mexico. (Trans. Amer. entom, soc. 1887, v. 14, p. 209-296, pl. 3.

Rev. by J: B. Smith (Entom. Amer. June 1888, v. 4. p. 52-56.)

Tabular separation, descriptions, sexual characters, synonomy and bibliography of 81, 30 new species of *lachnosterna;* the plate shows structural details. *S: H.* (4537)

Horn, G: H: Synopsis of the United States species of *notoxus* and *mecynotarsus*. (Trans, Amer. entom. soc. 1884, v. 11, p. 165-176.)

Sexual characters, tabular separation, descriptions, synonymy and bibliography; 13, 3 new, species of *notoxus* and 3 species of *mecynotarsus* are described. *S: H.* (4538)

Horn, G: H: Synopsis of the *philonthi* of Boreal America. (Trans Amer. entom. soc. 1884, v. 11, p. 177-244.)

Tabular separation, descriptions, synonymy and bibliography; 85, 50 new, species of *philonthus*, 23, 14 new, species of *actobius* and 10, 2 new, species of *cafius* are described. *S: H.* (4539)

Horn, G: H: Synopsis of the *throscidae* of the United States. (Trans. Amer. entom. soc. 1885, v. 12, p. 198-208, fig.)

Tabular separation and description of the genera and species of *throscidae;* bibliography and synonomy; figures *pactopus hornii*. *S: H.* (4540)

Hudson, G: Vernon. Protective coloration. (Entomologist, Aug. 1887, v. 20, p. 193-196.)

Cites numerous instances of protective coloration among New Zealand insects. *G: D.* (4541)

Johnson, L. N. Butterflies in southern Connecticut. (Science, 14 Jan. 1887, v. 9, p. 36, 7 cm.)

Notes difference in abundance of species of *pyrameis* in two successive years, in Connecticut; possible proterandry in *argynnis idalia*. *G: D.* (4542)

Kuwert, A. *Forficula auricularia* und *scolopendra forficata*, zwei feinde der lepidopteren und der schmetterlingsammler. (Entom. zeit. . . . zu Stettin, Oct.-Dec. 1879, v. 40, p. 508-511.)

Forficula auricularia ate off the antennae of a large number of lepidoptera while on the spreading boards; *scolopendra forficata* bite larvae in rearing box and kill them. *G: D.* (4543)

Landois, Hermann. Die duftapparate bei schmetterlingen. (Jahresb. d. Westfäl. provinzial-vereins für wissensch. u. kunst für 1885, 1886, p. 34.)

Brief account of the odorific apparatus of certain lepidoptera. Tümler adds, in discussing Landois' paper, that the larvae and imagos of *pieris brassicae*, are rejected as food by hens and other birds. *G: D.* (4544)

Lewis, D. M. Sound-producing ants. (Nature, 19 Jan. 1882, v. 25, p. 266, 6 cm.)

Reprint. (Sci. amer., 4 March 1882, v. 46, p. 135, col. 1-2, 7 cm.)

Discusses how to find out if ants produce sounds inaudible to human ears. *G: D.* (4545)

Matthews, A. Synopsis of North American *trichopterygidae*. (Trans. Amer. entom. soc. 1884, v. 11, p. 113-156.)

Tabular separation of tribes and genera; descriptions of genera and species: list of species. Describes two new genera, *championella* and *pterycodes*, and three new species from the United States. *S: H.* (4546)

Milton, F. Preservation of neuroptera. (Entomologist, Oct. 1887, v. 20, p. 284-285.)

Mode of removing viscera and oil from neuroptera, in order that they may retain their color as specimens. *G: D.* (4547)

Old ants and aged spiders. (Swiss cross, Jan. 1888, v. 3, p. 21-22, 19 cm.)

An account (from H: C. McCook) of a tarantula seven or eight years old, and of a queen ant which lived to be thirteen years old. *G: D.* (4548)

Osten Sacken, C: Robert. Luminous insects, especially diptera. (Entom. mo. mag., July 1878, v. 15, p. 43-44.)

Brief notes on the literature of luminous diptera, homoptera, and coleopterous larvae. *G: D.* (4549)

Plateau, Félix Auguste Joseph. Recherches sur la perception de la lumière par les myriopodes aveugles. (Journ. de l'anat. et de la physiol., Sept.-Oct. 1886, v. 22, p. 431-457, 6 fig.)

Separate. Paris, 1886, t.-p. cover, p. 431-457, 25 × 16, t 18 × 9.7; 6 fig.

Account of the effect of light upon eyeless animals as observed by different authors, and the modes of experimentation; concludes that blind myriopods can discover as quickly as can those with eyes whether they are in the dark or in the light. *G: D.* (4550)

Pollack, W. Einfluss des futterkrautes auf die färbung der imago von *arctia caja*. (Jahresber. d. Westfäl. provinzial-vereins für wissensch. u. kunst für 1885, 1886, p. 26.)

Heterophagic variation in *arctia caja;* also a mode of keeping the larvae through the winter. *G: D.* (4551)

Pollack, W. Präparierte raupen. (Jahresber. d. Westfäl. provinzial-vereins für wissensch. u. kunst für 1885, 1886, p. 15-16.)

Mode of preserving lepidopterous larvae by pressing them between plates of glass. *G: D.* (4552)

Popenoe, Edwin Alonzo. The "purslane caterpillar." (Industrialist [Manhattan, Kans.], 1 Oct. 1887, v. 13, no. 7, p. 21, col. 2-4, 68 cm.)

Habits and transformations of *euscirrhopterus gloveri;* figures of egg, young and adult larva, pupa and its case, and imago. *G: D.* (4553)

Pouchet, Georges. Le coloris dans la substance vivante. (Revue d. deux mondes, Jan. 1872, pér. 2, v. 97, p. 74-95.)

Kinds of coloration in animals and its physical causes; mimicry, beauty and other objects of the various colors of animals; changeable colors of some animals: some of the remarks are exemplified by insect-species. *G: D.* (4554)

Reid, N. H. Butterfly, origin of word. (Entomologist, Mar. 1888, v. 21, p. 93.)

Asks origin of the word butterfly; answered by J: T. C[arrington]. *G: D.* (4555)

Rendall, Percy. A rational method of setting the under sides of rhopalocera. (Entomologist, Dec. 1887, v. 20, p. 320-322, 1 fig.)

Describes a mode of setting wings of butterflies to show the underside, as if the butterfly were settled upon a flower. *G: D.* (4556)

Rendall, Percy. *Vanessa antiopa* with yellow borders. (Entomologist, June 1887, v. 20, p. 156.)

States that yellow-bordered, and fresh appearing specimens of *vanessa antiopa* are found in England. *G: D.* (4557)

Rombouts, J. E. De la faculté qu'ont les mouches de se mouvoir sur le verre et sur les autres corps polis. (Arch. du Musée Teyler, 1883, s. 2, v. 1, p. 185-200, 4 fig.)

Abstract, by author, with same title. (La nature, 15 Dec. 1883, ann. 12, no. 550, p. 34-38, 4 fig., 178 cm.)

Engl. tr., from *La nature*, entitled, "How flies hang on." (Pop. sci. mo., May 1884, v. 25, p. 68-73, 3 fig.)

Abstract, by the author, entitled, "Über die fortbewegung der fliegen an glatten flächen" (Zool. anzeiger, 17 Nov. 1884, v. 7, p. 619-623.)

Figures magnified foot of fly and of *polydrosus sericeus;* regards adhesion to smooth surfaces as produced by capillary action of hairs of foot on drops of liquid which they pour out; estimates the force of this capillarity in relation to the weight of a fly. *G: D.* (4558)

S[outh], R[ichard]. Pedigree moths. (Entomologist, Mar. 1887, v. 20, p. 60-62.)

Abstract of a paper by Francis Galton, read before Entomological society of London, Feb. 1887, in which breeding of moths from specimens selected with especial reference to certain characters with a view of obtaining certain data on heredity is discussed. *G: D.* (4559)

Tümler, ———. Lebensdauer der tagschmetterlinge während des sommers. (Jahresber. d. Westfäl. provinzial-vereins für wissensch. u. kunst für 1885, 1886, p. 30-31.)

The author was unable to keep *pieris brassicae* alive in a room in summer as long as eleven days. *G: D.* (4560)

Tutt, James W. The preservation of larvae by inflation. (Entomologist, May 1887, v. 20, p. 132-134, 1 fig.)

On inflating lepidopterous larvae. *G: D.* (4561)

Walker, F. A. Notes on *vanessa antiopa*. (Entomologist, July 1887, v. 20, p. 176-177.)

Notes on different occurrences of *vanessa antiopa* in England; believes it to be less abundant than it formerly was. *G: D.* (4562)

Dr. **Wallace** on the development theory. (Science, 17 Dec. 1886, v. 8, p. 560-563, 140 cm.)

Abstract of four lectures by A. R. Wallace on evolution, delivered in Baltimore 30 Nov., 2, 7 and 9 Dec. 1886; among the subjects dealt with were protective mimicry and other means of protection in insects. *G: D.* (4563)

ENTOMOLOGICAL ITEMS.

DR. A. S. PACKARD. The June (1888) numero of the *Popular science monthly* contains a sketch of the life and services to science of Dr. A. S. Packard. A portrait accompanies the article.

EPHEMERIDAE.—Rev. A. E. Eaton having completed his monograph of recent Mayflies (Trans. Linn. soc. Lond. s. 2, v. 3 pp. 352, 65 plates) gives in the June and July numeros of the Ent. mo. mag., a generic synopsis with annotated list of thirty-seven British species.

ENTOMOLOGICAL CLUB, A. A. A. S.—The next meeting of the club will be held at Cleveland, Ohio, in the High School building, on Wednesday, the 15th of August, at 9 A. M. Entomologists intending to present papers should send the titles to the same to the secretary, Prof. A. J. Cook, Agricultural College, Michigan in order that they may be announced in the programme.

LEBARON'S REPORTS.—As state entomologist of Illinois, Dr. William LeBaron prepared the four reports for the years 1871 to 1874, the second to the fifth of the series. Prof. S. A. Forbes has copies of these which he will send to entomologists on receipt of the requisite amount of postage. The first report requires three cents postage, the second and third each two cents and the fourth six cents. Prof. Forbes' address is Champaign, Illinois.

CURCULIO INJURY TO CHERRIES.—According to experiments carried on at the Ohio station three-fourths of the cherries liable to injury by the Plum curculio, *Conotrachelus nenuphar*, were saved by spraying the trees with London purple, used in proportion of one ounce to five gallons of water. The spraying was done soon after the blossoms fell. On check trees where the spraying was omitted the curculios did much damage. No trace of the poison was discovered on analysis of the fruit a week after spraying. Spraying with a solution of lime was also tried but was less effective, only forty per cent being saved.

GLOSSINA MORSITANS.—V. Fric, natural history dealer, Wladislawgasse 21, Prague, offers among other interesting entomological material specimens of the famous TSETZE-FLY, *Glossina morsitans*. This species which is allied to our common STABLE-FLY, *Stomoxys calcitrans*, is so injurious to horses and cattle that some portions of tropical Africa are rendered impassable. Though locally abundant the species is rare in collections. Westwood in Proc. zool. soc. London, 1858, v. 18, describes and figures three species of *Glossina* and remarks upon their supposed connection with the fourth plague of Egypt.

BEES IN THE MAILS.—Under date of 17 July 1888 the postmaster-general announces "The Canada office having assented to the proposition of this department to admit to the mails exchanged between the United States and Canada packages of queen bees and their attendant bees when so put up as to prevent injury to those handling the mails, while at the same time allowing an easy verification of the contents, packages of bees will hereafter be entitled to transmission by mail to Canada provided they conform to the conditions prescribed for them in the domestic mails of this country, and similar packages received in the mails from Canada should be promply forwarded to their destinations and delivered to addresses."

AN ARMY OF MYRIOPODS.—Mr. W. H. Cleaver of East Bethlehem, Pa., writes to Mr. Edwin Linton concerning an army of myriopods as follows, "they are travelling eastward in countless millions. They travel at night or in the cool of the morning and evening. They camp during the day by getting under sods, boards, stones or anything to protect them from the heat of the sun. In some places during the day they are piled up in great numbers. They do not seem to de-

stroy anything on their journey but go harmlessly along. Fowls will not eat them and birds do not appear to molest them."

Mr. Linton identifies the species, with some doubt, as the common *Polydesmus erythropygus*. *Science*, 13 July 1888, v. 12, no. 284, p. 24.

RIVERSIDE NATURAL HISTORY. — Under this title Messrs. Houghton, Mifflin and company have issued a new edition of THE STANDARD NATURAL HISTORY (S. E. Cassino & Co.). The insects occupy nearly five hundred pages of the second volume and with the exception of an appendix by Dr. Packard, and a bibliography of some of the more important publications by Mr. Woodworth, the text of the two editions is unchanged. Dr. Packard's contribution consists of a brief account of the *Thysanoptera* (*Thrips* and allies). The bibliography would have been more useful if some arrangement (either alphabetical or chronological) had been followed. Two plates, a swarm of May-flies and the Hercules beetle originally printed plain are given in color; they are taken from Brehm's *Thierleben* as are a large number of the figures. No credit is given in either of the editions for any of the illustrations; this is a mistake from every point of view. It is as important for the editors and publishers to show, as it is for the neophyte to know, that the illustrations are from eminent authorities.

ON MELANISM IN LEPIDOPTERA. — A casual observation this spring led me to form a hypothesis as to the cause and meaning of melanism in *Lepidoptera*, which appears to explain a considerable majority of the instances, and at the same time, correlates various facts in connection with it, that are otherwise of obscure import. I am not sufficiently acquainted with the literature of the subject to know whether the same hypothesis has been advanced before, but I do not happen to have met with it. Melanism appears to be a western rather than a northern form of variation, to be associated with a wet rather than with a cold climate; and it has certainly been more common of recent years, which may be attributed to the long succession (unprecedented) of wet seasons we have recently passed through. My observation was on *D*[*iurnea*]*fagella*. Twenty years ago this species afforded here an occasional dark or even black *var.* Happening to meet with one of these, I searched carefully for two seasons, but only got one black and two dark specimens. For the last year or two (result of wet seasons) they have been fairly numerous. Visiting certain oak trees with a lantern one night lately, and the same observation might, occasion favoring, no doubt have been made during the day, I found the dark *var.* quite numerous, about one to three of the ordinary form. The point I wish to call attention to is this: the afternoon had been showery, and one side of the trunk was very wet, the other dry, the wet side was of a very dark color, the dry portions pale, and, as a consequence the dark specimens of the *fagella* were very conspicuous on the dry portions, hardly visible on the wet, whilst with the ordinary form the conditions were reversed, those on the wet bark were conspicuous, those on the dry much less so. This observation appears to admit of generalising, because we know that many trunks of trees, rocks, stones, mosses, &c. are much darker in color when wet, the change often being from pale grey to black, and that most of the species that are subject to melanic variation are such as are in the habit of resting on such objects; natural selection would thus have abundant leverage to work with. I do not know whether the melanism of the Lancashire and Yorkshire districts is acknowledged to depend on the general griminess of all natural objects, trees, stones, &c., but there is no doubt that this blackness of the resting places of insects is intensified when they are wet. This hypothesis will not probably explain all cases of melanism, but it seems to be widely applicable. — T. A. CHAPMAN, in *Ent. mo. mag.* July 1888, v. 25, p. 40.

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CONTENTS:

ADVERTISEMENTS 98
HILARIMORPHA AND APIOCERA — *Samuel Wendell Williston* 99–102
DESCRIPTION OF ASPHONDYLIA HELIANTHI-GLOBULUS—*John Marten* . . . 102–103
SOME ACCOUNT OF OUR SPECIES OF GEOTRUPES—*Frederick Blanchard* . . 103–110
NOTE ON CHINCH-BUG DISEASES—*Stephen Alfred Forbes* 110–111
NOTE ON THE WHITE ANT, FOUND ON THE BAHAMAS—*Charles J. Maynard* . 111–113
WALCKENAER'S NAMES OF AMERICAN SPIDERS—*James Henry Emerton* . . . 113–114
BIBLIOGRAPHICAL RECORD, NO. 4564-6424 115–118
ENTOMOLOGICAL ITEMS 119–120

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Having accumulated a very large stock of references to the literature of many subjects of knowledge (and especially of entomology), I will furnish references on special subjects at ten cents each.

(See PSYCHE for Oct.-Dec. 1884, v. 4, p. 223).

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LIBRARY OF THE CAMBRIDGE ENTOMOLOGICAL CLUB.

The librarian of the Cambridge Entomological Club calls attention to the desirability of preserving in the library of the Club as complete a series of entomological publications as it is possible to collect. It is especially desirable to preserve the transient literature of the subject—separates, small pamphlets and newspaper articles—and the librarian will be pleased to receive single copies of the daily papers, scientific journals, magazines, or agricultural papers, which contain entomological articles. These papers are preserved and catalogd, and, because they are overlooked by large general libraries, are just the kind of material that should be preserved in a special entomological library. Any one who has sought for some of the best of the agricultural journals of the western states in libraries will appreciate any effort made to preserve journals of this sort.

Separates which are often thrown into the waste-basket, as useless, as too small for preservation, as duplications of parts of serials, or as valueless, are respectfully solicited. The friends of the Club are also asked to send a copy of newspapers in which they have published articles or notes on entomological subjects. If these notes are anonymous, the author's name will be acceptible information.

The accessions to the library of the Club had reached the number of 1643 at the end of last year (1887).

Direct all papers for the library to

CAMBRIDGE ENTOMOLOGICAL CLUB,
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PSYCHE.

HILARIMORPHA AND APIOCERA.

BY SAMUEL WENDELL WILLISTON, NEW HAVEN, CONN.

In the examination, recently, of a small collection of Diptera sent me by Mr. Charles Robertson of Carlinville, Illinois, I detected several specimens, which, upon examination, proved conclusively to belong to the genus *Hilarimorpha*, whose systematic position has been the subject of some discussion. The two other known species, both European, were first located by Schiner, the author of the genus, in close proximity to *Hilara* in the family *empidae*. Later, from a renewed study of the subject, he arrived at the conclusion that they "undoubtedly belong to the *leptidae*." Mik, more recently (Ueber die systematische Stellung des Genus Hilarimorpha Schin., Verh. Zool. Bot. Gesellsch. 1881, pp. 327-329), has presented cogent reasons why the first location by Schiner is the correct one,—arguments with which, from the study of the present closely allied species, I fully agree. Roeder has recently published some remarks upon this subject, which I regret not to find among the copies of his papers that he has kindly sent me.

Professor Mik here takes the view, I may add, that a more decisive ground for an opinion regarding the position can be expected only when the earlier stages are known, which unfortunately is not the case at present. Perhaps in such a case as the present, where there may be doubt, some important characters or mode of development in the immature stages may be sufficient to decide its position, but I am far from the belief, as I have elsewhere expressed myself, that characters drawn from the immature stages are of greater or even equal value with those shown by the adult insect. Professor Mik, with Professor Brauer, is inclined, as shown by his remarks in a recent number of the Wiener Ent. Zeit., to subordinate adult characters in classification. But, notwithstanding the deservedly high repute of both these eminent entomologists, I cannot but differ with them, in a measure at least. Resemblances, in my opinion, are everywhere of more importance than differences; I do not think it desirable to separate species or genera that show important resemblances in the adult stage, no matter how important may be the differences of larvae or pupae. The differences among the earlier forms of the *ceci-*

domyidae, for instance, are much more important than the differences presented by the imagines; nevertheless, one will not split the *cecidomyidae* into corresponding families for that reason. Following is the description of the new *Hilarimorpha*, whose specific name it gives me pleasure to choose in honor of Professor Mik.

Hilarimorpha mikii, *n. sp.*

♂ Length 4 mm. Eyes broadly contiguous. Face opaque gray, with grooves from the oral margin. Antennae brownish yellow; the first two joints short, the third oval, a little longer than broad, the anterior borders straight or gently concave to the insertion of the slender two-jointed style, which is nearly as long as the body of the joint. Thorax in ground-color black, thickly covered on the mesonotum with opaque yellowish pollen; on the pleurae with lighter, less dense pollen. Abdomen with each segment anteriorly brownish black; posteriorly broadly banded with opaque yellow, of a color somewhat lighter than that of the mesonotum. Legs yellow, the terminal joints of the tarsi infuscated. Wings blackish, a little lighter behind.

Four specimens. Carlinville, Illinois (Charles Robertson.)

The neuration is quite as figured by Mik, in the paper above quoted, for the European *H. singularis* Egg.; the wing and cells are somewhat narrower. The third antennal joint is shorter, and the style longer than in *H. tristis*. The tarsi show no trace of an empodium under a compound microscope.

For the reception of this genus a slight change will be necessary in the table of families recently published by me, as follows:

29.—Anal cell narrowly open or closed near the border; discal cell present. *Bombylidae*.

Anal cell closed near the border: discal wanting. *Hilarimorpha* Schin.

Anal cell closed remote from the border. *Empidae*.

Baron Osten Sacken published,* not long ago, an elaborate article on the systematic position of the genus *Apiocera*, in which he combated the views of Schiner as regards the location of it under the *midaidae*, and sought to show that its proper position was among the *asilinae*. Other authors have not generally been in accord with him. Wiedemann, the first who described any species pertaining to the genus, looked upon the form as that of an Asilid. Westwood, the author of the genus, hesitated between the *midaidae* and *nemistrinidae*. Macquart established a new family for the genus, locating it next the *therevidae*. Philippi described a new species as an *Asilid;* and Gerstaecker, while refusing it admission to the *midaidae*, knew not where to place it. Schiner, on the other hand, insisted upon its union with the *midaidae;* Coquillett with the *therevidae;* Brauer and Mik as forming a distinct family allied to the *therevidae*. Finally, I too would

*Berl. Ent. Zeitschr. xxvii, 287-294.

give to the group a family rank, locating it between the *asilidae* and *midaidae*.

The simultaneous possession of four species, three from Australia and *A. haruspex* O. S., will, I hope, give some weight to the remarks I would here offer concerning its true systematic position. As Osten Sacken very justly remarked in a letter to me, the group is an old one geologically, and within certain limits will show wide structural variation. In one of the species, both male and female, now before me, there is no indication whatever of any anterior branch to the third longitudinal vein. The absence of this vein under some circumstances would indicate very great structural differences, but, as Cope has more than once said, generic, or even family characters in transitional forms or isolated groups may cease to have even a specific value. Here a well-marked family character among the *asilidae*, *therevidae* and the like, I am satisfied has nothing more than a specific value, if it has even that. The *apioceridae* is an old, isolated, geological form; it cannot be allied to the *therevidae* or *asilidae* without doing violence to genetic relationships. On the other hand, the *midaidae*, certainly the *nemistridae*, and perhaps also, the *acroceridae*, are all families undergoing a similar decadence; all are apparently old geologically; all show remarkable neurational variations within narrow limits, and all, except perhaps the *acroceridae*, seem to have more than an accidental coincidence in their geographical distribution. Numerous forms of *nemistrinidae* and *midaidae* occur both in Australia and South America, as I can state from the examination of specimens. I do not wish it to be inferred from the above that *apiocera* should be looked upon as only an aberrant type of *midaidae*, but rather that the *apioceridae* from their isolated position should be recognized as distinct in the same way that these other families are. In one thing I agree with Osten Sacken; the shortness of the first longitudinal vein in *therevidae* points to a more remote geological divergence. The argument of fleshy labella has little weight, for in one of the species before me the proboscis is elongate, slender, and the labella small.

My views, then, in brief are: the *apioceridae* form an isolated group approaching extinction, it is probably most nearly related geologically to the *nemistrinidae* and *midaidae*, next to the *asilidae*, and less intimately to the *therevidae*. In consideration of these views it seems to me best to recognize the group as a distinct one under the name of *apioceridae*.

One other thing that has impressed me in the examination of a considerable collection of the South American flies, and a small one from Australia, and that is the points of resemblance that exists between the dipterological faunae of the two continents. This resemblance, too, in some respects, is more than superficial. With only my small collection for comparison I have

found no less than three genera of *asilidae* identical, and unknown elsewhere.

I regret never to have seen a specimen of *Rhaphiomidas* O. S., one of those peculiar transitional forms about which opinions will differ. Baron Osten Sacken has recently rejected it from the *midaidae*, and, judging from the description of the antennae, with good reason. These organs seem to be quite like those of the Dasypogonid *Ospriocerus*. In some features the form seems intermediate between *Apiocera* and the *asilidae*, but the wing structure is so different from that of the latter family that I do not think it should be united with it. I would rather place it among the *apioceridae*. These and the many other oscilant genera in the Orthorrhaphous diptera serve only to emphasize the fact that nature abhors classification, and the only good that can come from their discussion is the elucidation of the relative values of different structural characters.

DESCRIPTION OF ASPHONDYLIA HELIANTHI-GLOBULUS.

BY JOHN MARTEN, CHAMPAIGN, ILL.

This fly is recorded in Osten Sacken's Catalogue of N. A. Diptera, p. 5, as *A. helianthi-globulus*, Walsh (*in litt.*). Osten Sacken gives the following comparison. Trans. Am. Ent. Soc. Vol. III, p. 52.—"*A. rudbeckiæ conspicua* at first sight is not unlike *A. helianthi-globulus*, Walsh in litt., of which I owe a specimen to my lamented friend. Walsh's species, however, is easily distinguished by the paler color of its hind tibiae and tarsi. Its general color is also paler brown, with a yellowish-brown pubescence; its coxae are pale; the vein ending in the apex of the wing is less arched than in *A. rudbeckiae*.

"*A. helianthi-globulus*, Walsh, forms a rounded swelling on the stem of *Helianthus*. As it has never been described these notes may serve to identify it."

Imago, ♂ ♀, blackish brown, covered with grayish hairs (dry and alcoholic specimens become more brown); feet black with grayish hairs, femora brownish; hind tibiae, short first joint of the tarsi and the long second joint whitish tipped with black hairs. Wings clothed with dark grayish hairs, dusky; venation like that of *A. monacha*, *O. Sack.*, it consists of three veins the last of which is forked, the anterior branch being partially concealed in a fold which extends to the root of the wing; the second vein is nearly straight and ends almost in the middle of the apex. The antennae are fourteen jointed (2 + 12), filiform and pubescent; the joints of the flagellum are cylindrical, of nearly equal gradually diminishing length up to the ninth; the tenth is smaller than the ninth; the eleventh and twelfth to-

gether are about equal in length to the tenth. Halteres light brown. The ovipositor is stout, cylindrical and furnished with a long needle-like organ which protrudes beyond the tip.

Length four mm. Emerges in September and October.

The pupa has two contiguous, short, subconical projections at the top of the head; the dorsal segments of the abdomen have on the middle of each a somewhat irregular double transverse row of short spines, and behind it a single regular row of similar spines, the last segment, at the tip, has a row of such spines.

Osten Sacken compares, briefly, this pupa with *A. monacha*, Trans. Am. Ent. Soc. Vol. II, p. 301.

The galls are formed on the stem of *Helianthus grosse-serratus*, from a few inches to three feet or more above the ground; they are globular, spherical or ovate, in shape, from three-eighths of an inch to two inches in diameter.

The pupa in extricating itself from the gall may leave its case protruding from the place of exit or may drop to the ground before leaving its case.

SOME ACCOUNT OF OUR SPECIES OF GEOTRUPES.

BY FREDERICK BLANCHARD, LOWELL, MASS.

Several familiar species of *Geotrupes* are among the first acquisitions made by the beginner of a collection of coleoptera in the Eastern United States. They are in fact so abundant and easily found that the interest in them soon ceases, and this part of one's collection makes about the poorest exhibit of the whole, from the fact that the clumsily pinned, poorly cared for specimens of our early inexperience alone appear as representatives of the species. As I have recently observed, however, in Mr. Henry Ulke's collection, a series of good examples of the different species and their varieties is an ornament instead of, as is too often the case, a disgrace to the collection. It is not always best to neglect old friends, and in our common species of *Geotrupes* the very interesting male peculiarities are quite worthy of occasional attention, as they form the basis of a natural classification.

In 1865 M. Henri Jekel published in the "Annales de la Société Entom. de France," an arrangement of the species of this genus, adopting the plan of making subgenera of the different divisions, paying especial attention to our North American species, and describing several from this country as new. A little later Dr. G. H. Horn, in 1867, in the Transactions of the Amer. Ent. Soc. vol. i, reviewed M. Jekel's paper at length as far as it related to our species, placing before American students the true relations and limits of the species at the same time very properly suppress-

ing of all M. Jekel's new species, but one, as varieties of well known species. Since Dr. Horn's paper appeared Dr. Le Conte has described *G. chalybaeus* from an imperfect specimen found in Florida, and Dr. Horn has described *occidentalis* from a single ♀ from California, giving at the same time a table for the determination of the species. In the present essay two more species are made known and as one of them is not admissible into any of the subgenera of Jekel, in order that its characters may be properly understood, it seems worth while to pass in review the different forms hitherto known in our fauna. At the same time an opportunity is afforded me by the kindness of Mr. Ulke to give some further details respecting *G. chalybaeus*. This last species by its form and structure is an obvious interruption in our series, and I have placed it at the end of the genus for the present. It seems equally out of place among any of the exotic subgenera mentioned by Jekel, and the proper course appears to be to establish a distinct genus for it.

The genus is primarily divided by Jekel into those having the second joint of the antennal club entire and into those having the second joint more or less emarginate beneath so that when the joints are closed the margin of the joint is more or less hidden. This appears to be a natural division, but in the case of *G. balyi*, the only species thus far known in our fauna belonging to the second division, there has been some confusion on the part of Jekel, and also in American collections from the fact that in many specimens the second joint of the club is only very slightly thinned at the lower margin, or even not noticeably different from the normal form. A better character for our fauna is the one pointed out by Dr. Horn, namely the greater widening of the elytral margin towards the base. In his description of *starkii*, based upon a ♀ specimen and included in the subgenus *Onychotrupes*, Jekel alludes to this broad margin in his specimen as being peculiar to *starkii* and not seen in the other species of the subgenus. Dr. Horn, however, at once recognized that *starkii* was simply a specimen of *balyi* with the antennal club normal. Another character accompanying the wider elytral margin in our fauna is seen in the sutural and second striæ of the elytra. In the first division, in all of our striate species except one, the sutural stria is interrupted by the scutellum, and does not reach the base, while the second stria is entire and reaches the base of the elytra. In the second division the sutural stria arises at the base of the elytra and follows closely the margin of the scutellum, thus interrupting the second stria which in this case fails to reach the base.

G. balyi was included by Jekel in his subgenus *Anoplotrupes*, the species of which do not have any special ♂ characters. While recently studying this species it was observed that in certain large quite black individuals associated with the usual dark bronzed green forms under the same name, the sexes were

very readily separated by quite unique characters in the ♂ which were entirely absent in the true *Anoplotrupes*. Following the Jekelian plan this newly recognized form should be placed as a subgenus between his *Canthotrupes* and subgenus *Geotrupes* for which the name *Melanotrupes* is suggested, and full particulars given further on.

Geotrupes chalybaeus is much less convex than usual, the sides of the thorax at base moderately explanate, the sides of the elytra rather strongly explanate in front, the margin being wide as in *Melanotrupes* and *Anoplotrupes*, but flatter; the epipleuræ are also horizontal instead of oblique as usual; there is within the margin a marked constriction of the sides of the elytra behind the humeri. The most remarkable peculiarity of the species is in the form of the middle and hind tibiae. Instead of having the apex on the outer side indicated by a well-defined ridge as usual, the ridge is completely absent, and only its position is indicated by two or three bristles, so that the apex as seen from above or below is broadly rounded or very obliquely truncate. This character appears to be quite anomalous in *Geotrupes*, as, if it had existed in any of the species known to Jekel it would have been noticed, as he is very particular in giving the form of the tibiae and the number of transverse ridges on the outer face counting the apical as first. Some further particulars will be given under this species below. The name *Peltotrupes* might be used for this subgenus.

The following arrangement of the subgenera is based upon Dr. Horn's, given in the "Transactions," vol. i.

a. Middle and hind tibiae with apical ridge on the outer side.

b. Apterous, elytra connate, metasternum short, thorax dissimilar anteriorly in the two sexes, elytra not striate. *Mycotrupes.*

bb. Alate, elytra free, thorax similar ♂ and ♀.

c. Elytral margin moderate, antennae with the second joint of the club normal, entire, apex of anterior tibiae produced inwardly in the ♂, simply toothed in the ♀.

d. Middle tarsi of the ♂ very short and thick, claws of the same chelate. *Onychotrupes.*

dd. Middle tarsi and claws of the ♂ normal. *Cnemotrupes.*

cc. Elytral margin broad towards the base, second joint of antennal club more or less emarginate or truncate beneath, but sometimes not distinctly so, sutural stria reaching the base, second interrupted, apex of anterior tibiae alike in both sexes.

e. ♂ with anterior thighs toothed at base, anterior tibiae with the third tooth from the apex deflexed, partly inferior. *Melanotrupes.*

ee. The sexes alike. *Anoplotrupes.*

aa. Middle and hind tibiae without external apical ridge. *Peltotrupes.*

The only species of *Mycotrupes* is *retusus* Lec. "found in the southern states feeding on fungi or under dried animal matter."

Of *Onychotrupes* there are two species in our fauna, *splendidus*, variable in brilliancy of color from "brilliant metallic green to a dark bronze," the elytral striae are punctured, the basal margin of the thorax is entire. Second, *semiopacus*, having the head not tuberculate, the thorax usually with the basal marginal line absent in a greater or less degree and with the striae of the elytra impressed but not punctate, interstices flat, smooth. The ♂'s in this subgenus have the hind thighs with a small tooth, more or less marked, at the base beneath. The inferior longitudinal carina of the anterior tibiae is distinctly serrate in both sexes of *splendidus*, but only feebly crenate in *semiopacus*. The middle and posterior tibiae have usually four distinct transverse ridges on the outer face in both.

As only the ♀ of *G. occidentalis* is known it is not certain that it is a *Cnemotrupes*. I have however included it in the following table:

Thorax with basal margin entire.
- Anterior tibiae of ♂ with a long spur, scutellum transverse.
  - Shining dark bronzed green, elytral striae coarsely crenately punctured, club yellow. *egeriei*.
  - Opaque, striae punctured, scarcely impressed, club sooty. *opacus*.
- Anterior tibiae with a short spur in the ♂, scutellum equilateral, striae rather finely punctured. *blackburnii*.

Thorax with basal margin obsolete at the sides.
- Elytral striae very feebly impressed, punctured, head not tuberculate, apical spur of ♂ short, scutellum very small. *ulkei*.
- Elytral striae impressed and punctured, head tuberculate. *occidentalis*.

In the first three species the hind thighs are toothed in the ♂ and the inferior carina of the front tibiae is serrate in both sexes, more strongly in the ♂, and in *blackburnii* the alternate teeth are sometimes very prominent. The middle and hind tibiae in the same species have about four transverse ridges, the upper one sometimes imperfect.

Geotrupes ulkei n. sp.—Size small, convex, shining brown bronze, lateral margins of the thorax and elytra blue. Head shining, rough in front and at the sides, rather sparsely punctate behind, clypeus broadly rounded in front, feebly convex without any evident tubercle, sides of the head rounded as usual forming at its junction with the clypeus an obtuse reentrant angle, clypeal sutures impressed, the usual ante-ocular ridges present. Antennae with the fourth joint shorter than the third or fifth, club sooty. Thorax nearly twice as wide as long, the apex more than half as wide as the base, sides strongly rounded and margined, angles all rounded, base lobed at middle, marginal line distinct at middle, quite absent each side, surface faintly punctulate, very sparsely punctured on the disc except on the median line which is slightly impressed

and more closely punctured, punctures more numerous at the sides where the usual fovea is evident. Elytra about twice as long as the thorax and scarcely wider, slightly narrowed at base thence with the sides broadly rounded to the apices which are prominent and not at all inflexed. Striae fine and but feebly impressed, with rows of small punctures, intervals flat with a sparse and rather indistinct punctulation, scutellum equilateral, smaller than usual so that the sutural striae reach the base, but they are not so near the scutellum as in *G. balyi* etc., nor do they interrupt the second striae which reach the base as usual in the subgenus. Body beneath black or slightly bronzed, rather sparsely clothed with brown pubescence and bristles; mesosternum with a prominent somewhat semicircular crest between the coxae; middle tibiae shorter than the posterior ones, gradually wider like them, but thicker when viewed laterally, both pairs have three distinct transverse ridges counting the apical one; the anterior tarsi are more slender than the others, the first joint short, the second equal in length to the third and fourth united, but more slender; in the middle and hind tarsi the first joint is elongate nearly equal to the next three which are but little longer than wide and gradually decrease in length and thickness, last joint longest in the middle tarsi, about equal to the first joint in the hind pair, longest spur of middle and hind tibiae equal to the first three joints in the ♂, scarcely longer than the first two joints in the ♀. Anterior tibiae with five or six lateral teeth, the inferior ridge finely, sparsely, crenulate or denticulate in both sexes. In the ♂ the apex of the front tibiae is strongly, acutely produced obliquely inward and forward, the terminal spur is short not very stout about equal in length to the second joint of the tarsi. Hind thighs unarmed.

Length, ♂ 11 mm., .44 in.: ♀ 12 mm., .48 in.

One pair Va. found by Mr. Ulke in fungi.

On comparison with diminutive specimens of *blackburnii* and *balyi* of the same size, the scutellum is seen to be distinctly smaller in the present species.

It affords me great pleasure to give Mr. Ulke's name to this interesting little species in recognition of many favors.

In the subgenus *Melanotrupes* the following described species only is known to me:

G. hornii, n. sp.—Black, shining, without any metallic reflections clothed beneath with dark brown hair, form robust. Clypeus oval, a little more prominent in the ♀, its entire surface rugose punctate, a distinct tubercle behind more or less acute, the sutural impression deep, the anteocular ridges of the head are well marked, the sides rounded as usual; antennae with the fourth joint shorter than the third or fifth, club yellow with the second joint more or less emarginate or truncate and thinner below; thorax of the usual form, broadly emarginate in front, the

angles distinct scarcely rounded, somewhat obliquely wider to the middle, thence rounded and inflexed at the posterior angles which are rounded, usually a little wider behind the middle, a median impressed line more or less punctate, disc sparsely and irregularly punctate, sides more closely, the usual lateral fovea distinct, basal margin distinct; scutellum triangular as usual, smooth or with a few punctures, sometimes impressed; elytra about as wide as the thorax, a little narrower at the base, broadly rounded to the apex which is obtuse, the margins slightly inflexed at the suture, striae strongly impressed and crenately punctured, rather more coarsely than in *balyi*, intervals convex, smooth, sutural striae embracing the scutellum and reaching the base, second stria more or less interrupted by the sutural and not reaching the base, margin of elytra much wider anteriorly; anterior tarsi with joints one to four subequal, last joint nearly equal to the three preceding; spurs of anterior tibiae long in both sexes, reaching the apex of the third joint of the tarsi or beyond; mesosternum carinate between the coxae, produced forward in a rounded crest; middle and hind tibiae with three transverse ridges on the outer face, the upper one incomplete, middle tibiae shorter than the last, the tarsi also a little shorter with the first joint about equal to the next three together, while in the last, the second, third and fourth joints are a little more elongate and together obviously exceed the first in length; spurs of middle and hind tibiae long and slender, the longer one of the middle tibiae reaching the apex of the third joint, that of the hind tibiae reaching the apex of the second joint; inner apical process of the hind tibiae subparallel, rounded at tip and one-half as long as the first joint of the tarsi. The ♂ has the base of the anterior thighs below with a conspicuous oblique ridge or broad tooth, the anterior tibiae with the third tooth from the apex deflexed and produced beneath, sometimes meeting a slight angulation of the inferior carina, this carina at about one-third from the base has a prominent tooth. The ♀ has the anterior thighs and tibiae simple.

Length 13.-18. mm; .52-.72 in.

Specimens are before me from Mass., D. C. and N. C. and I infer that the species has a similar distribution with our common species. It appears to have been sufficiently rare to have escaped the earlier authors and later has probably been confounded with *balyi* from which it differs apart from the sexual characters by the always distinctly black color without any metallic reflections, the more advanced clypeus, the less sparsely and rather more strongly punctured thorax, the mososternal crest rounded instead of acute, the hind tibiae with the upper or third ridge more developed and the apical process longer and narrower at base. So far as observed the emargination of the second joint of the antennal club is well marked.

In dedicating this very distinct

species I would express my hearty admiration of the great zeal and success in studying our Coleoptera, of Dr. Geo. H. Horn.

Of the habits of *G. hornii* I cannot now say much. Mr. Ulke writes me that he finds it under electric lights in Washington, but that he does not thus find *balyi*, which is common, he says, in the mountains of Virginia. The latter species is also common about fungi in Massachussets.

Anoplotrupes has but one species in our fauna, *balyi*, sufficiently defined by the table of subgenera and the comparative notes above. It is usually smaller than *G. hornii*, the color is usually a deep black green and always more or less metallic. Specimens have been seen with the bottom of the striae distincly purple, others have the whole surface of the elytra and even the thorax purple.

Peltotrupes chalybaeus is polished black blue with the lateral margins of a brighter blue, three or four striae next the suture on each side are impressed, the others hardly impressed, all have rows of fine punctures. The anterior tibiae have on the upper surface the usual inner impressed line bearing a row of setae but the adjacent outer carina is quite absent. The middle and hind tibiae are rather densely fringed with spines on each outer margin and on the cross ridges and the spaces between are punctate and bear short bristles; in our other *Geotrupes* the middle and hind thighs are flattened posteriorly to receive the tibiae, and have the margins finely elevated each side, while in *chalybaeus* they are convex behind with a single strong margin which is next to the upper side.

The middle and hind tarsi are rather thickly beset with long bristles; the claws are long and slender.

In the ♂ the apex of the anterior tibia is abruptly and strongly produced inwardly and the spur is rather short; there is a small tooth directed inwardly behind the insertion of the tarsi; the inferior carination of the tibiae is armed with three or four prominent teeth alternating with finer ones, the hind thighs are toothed at base. The ♀ has not been seen by me.

The third and fourth joints of the antennae are equal, fifth to eighth gradually shorter aud thicker.

In the preceding pages I have had all of the species mentioned before me with the exceptions of *retusus* and *occidentalis* and I have freely availed myself of the information given by Dr. Horn in his paper.

GEOTRUPES Latr.

Mycotrupes Lec.

G. retusus Lec. Proc. Acad. 1866, p. 381.

Onychotrupes Jekel.

G. splendidus Fabr. Syst. Ent. p. 18, no. 63.

miarophagus Jekel, Monog. loc. cit. p. 611.

var. mixtus Horn. Trans. v. 1. p. 316.

G. semiopacus Jek. l. c. p. 612.
melsheimeri Jek. l. c., p. 613.

CNEMOTRUPES Jekel.

G. egeriei Germ. Ins. Spec. i, p. 144.
lecontei ♀ Jek. l. c., p. 592.
G. opacus Hald. Proc. Acad. 1853, p. 362.
haldemani Jek. l. c., p. 593.
chevrolati Jek. l. c., p. 595.
G. blackburnii Fabr. Spec. Insect. i, p. 20, no. 85.
excrementi Say, Jour. Acad. iii, p. 210.
var. jekellii Horn l. c., p. 317.
conicollis Jek. l. c., p. 591.
G. ulkei n. sp.
G. occidentalis. Horn Trans. v. viii, p. 144.

MELANOTRUPES.

G. hornii n. sp.

PELTOTRUPES.

G. chalybaeus Lec. Proc. Am. Phil. Soc. v. xvii, p. 402.

NOTE ON CHINCH BUG DISEASES.

BY STEPHEN ALFRED FORBES, CHAMPAIGN, ILL.

Two diseases of *Blissus leucopterus*, apparently efficient in suppressing an outbreak of this species in 1882, were described by me in my Report for that year as State Entomologist of Illinois (pp. 47–54); but neither of these has been distinctly recognized since, until the present season. Now, however, the chinch bugs of the southern part of Illinois are being very rapidly destroyed by both these diseases, and a third not hitherto recognized,—the last (seen by me first in July, 1887) due to a *Botrytis* distinct from the species (*B. bassiana*) well known as the characteristic fungus of muscardine in the silkworm.

One of the two first mentioned is caused by an *Entomophthora* whose specific affinities I have not been able to learn.

The other is due to a microbe (the *Micrococcus insectorum* of Burrill*) principally developed in the alimentary canal, and especially in its cœcal appendages, which are often literally crammed with it from end to end. This disease somewhat resembles that known as *schlaffsucht* or *flacherie* in the literature of the silkworm. Its germ is freely cultivable both in beef broth and in solid gelatine media, by the processes usual in bacterial investigation.

Both the *Entomophthora* and the *Botrytis* finally imbed the insect in a white fungus,—the efflorescence of a spore-bearing mycelium. The *Botrytis* has been much more abundant

*American Naturalist XVII, p. 319. This microbe, studied anew by Prof. Burrill from my recent cultures, solid and fluid, and from the affected chinch bugs themselves, proves to be a *Bacillus* of peculiar character, and not a *Micrococcus*.

and destructive in Illinois than the Entomophthora, although seemingly less so at present than the bacterial form.

It now seems likely that these diseases, occurring as they do spontaneously over a large area, will soon suppress what has probably been the longest-continued destructive outbreak of the chinch bug known in the history of that insect. Their present activity is illustrated by the fact that in a single field in Southern Illinois dead chinch bugs imbedded in this mold were found by an assistant, Mr. John Marten, so numerous as to suggest a recent flurry of snow.

NOTES ON THE WHITE ANT, FOUND ON THE BAHAMAS.

BY CHARLES J. MAYNARD, NEWTONVILLE, MASS.

Among the many objects of interest that engage the attention of the Naturalist on the Bahamas perhaps the most striking are the nests of the White Ants. The first that I saw was in the vicinity of Nassau in a cultivated field. It is the custom among the natives upon clearing away any portion of the low growth of trees, that occupy the land before it is tilled, to leave certain ones which serve for bean polls, or as a support for the stem of the yam which climbs to a considerable hight. The tree usually selected is the gumbo limbo, that has long naked branches, the twigs of which are only scantily supplied with leaves. These trees are so very often chosen by the ants as a support that it is not infrequent to see two or three nests in one field placed on them. The color of these domiciles is nearly black and as they are often of a large size they form conspicuous objects, even when seen from a distance.

The nest, of which I have spoken, was placed upon a limb some three feet from the ground, was about four feet high by some two feet in diameter and was very nearly of the form of an old fashioned bee hive. This object in the midst of the field presented such a singular appearance that it was only upon close observation that I convinced myself that it was not something made by the owner of the field, and placed there by him for some purpose.

Subsequent observation showed that the ants prefer to build in openings, and that the gumbo limbo is a favorite tree on which to place their nests; this may be explained by the fact that the trunks of these trees are covered with a smooth bark thus rendering the covered passages that the insects build between the ground and nests more easy of construction than on rougher material. There are two reasons, that appear plausible, why the ants prefer open fields to less exposed and more shady locations; the first of which is that they like the hot sunshine and free circulation to dry the moist material which is used in the

construction of the nests, second the materials from which they gather their building supplies, and which consists of dead wood, palm leaves, boards, shingles, etc., etc., are much more abundant in the fields than elsewhere. In fact so universally are these situations chosen that I do not now remember ever having seen a nest in any other place.

The nests, as related, are most often placed in trees, generally low and near the trunk, but I have occasionally seen them among the branches. I have also seen them on stumps and even on rocks, although this support is rarely used.

In form, the nests are, as remarked, hive-shaped whenever the basal support is large, but if it be small the ants will then build around it, producing another hive-shaped structure with its base upward which, resting against the base above, results in an oval-shaped nest. Sometimes, owing to the situation, irregularly formed nests are seen, but there is always a tendency to assume the hive shape. The nests are composed of various galleries about .20 of a inch high and about the same width, of varying length, opening into others in many directions, thus the whole system forms an exceedingly complicated labyrinth,. the clew of which is difficult to find, but which appears to be perfectly understood by the insects. From the nests to the ground and whenever the passages cross rocks, the surfaces of which are exposed, and this frequently occurs even at a considerable distance from the nests, the road ways by which the ants travel are always covered. These thoroughfares are of sufficient width to allow the insects to pass freely at all points, and upon breaking down any portion of a gallery they may be seen hurrying in both directions.

Whenever their passage ways are broken open some of the ants at once begin to repair it, and this brings me to the material used in building, and the method of depositing it. Fibers, gathered from dead wood, leaves, etc., and mixed with enough earth to give it a dark color form the principal portion of their building material. How this is applied, was for a long time, a mystery to me, for although I had seen many hundred nests it was not until Dec. 19th of last year that I chanced upon one of them upon which visable labor was being performed. I was passing a nest that stood on the margin of a field on Andros, when, attracted by its size, it being the largest that I had ever seen, measuring six feet in height by four and a half in diameter, I turned aside to examine it, and perceived that a circular piece some six inches in diameter was being built on one side. Something over two inches of the outer margin of this portion had been completed, leaving a circular hole in the centre. On this portion the ants were at work, standing around the unfinished margin as close together as possible without interfering with one another's movements. The workers are constantly changing, as one disappeared another took its place. Upon appearing each ant had its jaws filled with

building material and as it reached the wall it turned and exuded a drop of mucilaginous fluid from the abdomen then whirled instantly about and deposited its fibers upon it as it lay on the wall, mixing and moulding the mass with its jaws. This pulp had about the consistency of papier mache and was readily manipulated forming a wall of about the thickness of heavy writing paper. This hardens rapidly, but remains pliable for some time, thus the walls on the extreme outer edge of the newly erected portion could be bent without breaking, whereas the older portions are quite brittle.

As the orifice on which the ants were employed grew smaller, fewer and fewer could find room, yet there was no crowding, each keeping his accustomed distance from his fellows, so one after another they disappeared, as I watched, until but one was left to complete the minute hole remaining.

These ants are very destructive to buildings, especially to the small houses of the negros, and when they have once obtained a foothold the house is doomed. I knew of a small house in the neighborhood of Nassau that had not been occupied for a year or two that was two-thirds devoured by them. There was a nest on the roof, supported by the rafters, around which all the shingles had disappeared, while others were much eaten and all the posts were thickly perforated with their galleries. Such was the speed with which the ants worked, through industry and numbers, that the eroded surfaces appeared quite fresh, being of nearly the color of newly cut wood. The owner of this house informed me that he had destroyed every trace of the nest many times only to see it rebuilt, as fast as the ants could construct it.

[NOTE. Unfortunately Mr. Maynard did not preserve specimens of this termite for indentification and Dr. Hagen in his Monographie der Termiten does not mention any species from the Bahamas. In 1883 Mr. B. H. Van Vleck collected large numbers of *Eutermes ripperti* at Nassau, and Mr. Maynard's observations undoubtedly refer to this species, which is common upon many of the West Indian islands and in South America. See, Proc. Bost. Soc. Nat. Hist., December 1877 v. 19, p. 267–274 for Notes on the tree nests of Termites in Jamaica by H. G. Hubbard.—S: H.]

WALCKENAER'S NAMES OF AMERICAN SPIDERS.

BY JAMES HENRY EMERTON, BOSTON, MASS.

Mr. Henry C. McCook has called attention in the Proceedings of the Philadelphia Acad. of Nat. Sciences to the names of American spiders published by Walckenaer, and the necessity of using them in place of latter names given by Hentz and others.

There is no doubt that as far as these names can be identified with certainty and shown to be the oldest, they ought

to be used for the species to which they belong but the difficulty is, as Mr. McCook shows in this article, in their identification.

Walckenaer, as is well known, never saw the American spiders that he named. He bought a large number of drawings of spiders made in Georgia by John Abbot and published descriptions of the drawings, so that the first step in identifying Walckenaer names is to identify the drawings by Abbot.

The only known drawings of spiders by Abbot are in the library of the British Museum where they have been for a long time and have been shown to any person interested in them. These are probably the same drawings used by Walckenaer as Mr. McCook has compared the numbers and notes upon them with those referred to in Walckenaer's descriptions of similar spiders and found them to be the same.

Mr. McCook is inclined, however, to set too high a value on these drawings, for although his engagements prevented "him giving more than an hour or two to the study of the figures," and as far as mentioned, no American spiders were compared directly with them, he undertook to identify, off hand, a considerable number of them, a partial list of which he gives in this article with the revised names by which, as he says, "they must hereafter be known if Walckenaer's names are to be accepted."

In 1875 I looked over these same drawings at the British Museum and like Mr. McCook made hasty identifications of such few of them as I could. In my notes made at the time I find the following list.

4. Epeira placida Hentz.
54. Linyphia communis Hentz.
55. Young Linyphia marmorata Hentz.
65. Mubiona gracilis Hentz.
77,78. Uloborus.
79,80. Epeira caudata Hentz.
117. Epeira thaddeus Hentz.
116. Epeira insularis Hentz.
121. Epeira insularis.
122. Theridion sphaerula Hentz.
556. Epeira insularis.

A comparison of the numbers shows that only five of these identifications agree with those of McCook showing the uncertainty of off hand identifications of these drawings by two persons both familiar with the common spiders of the northern states.

The greater number of Abbot's drawings represent the spiders only in the most general and indefinite way and it seems to me improbable that any large number of them can ever be identified. At any rate this cannot be done until the spiders of the southern states have become better known. An attempt now to apply as many as possible of Walckenaer's names to any spiders that his descriptions or Abbot's drawings may possibly belong to, will only increase the number of uncertain names in use and so add to the labor of every future student of the subject. After the common spiders all over the United States have been described and are known to several students it will be possible to compare them with the descriptions of Walckenaer, Koch and Hentz with some prospect of finding out what these old descriptions are really worth and how many of them can be referred with certainty to particular species of spiders. With the present small number of students of American spiders it seems to me safer for each to use such names as appear to him the most certain even if not the oldest and leave the law of propriety and the "credit of entitulation" to take care of themselves.

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Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard; S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

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Habits of the red mite [*tetranychus telarius*], and account of experiments upon it with various insecticides. *G: D.* (4619)

Which was caught? (Swiss cross, Jan. 1887, v. 1, p. 32, col. 1, 7 cm.)

Two accounts of spiders attacking bees that had been entangled in their webs, the bees escaping and carrying away the spiders in their flight. *G: D.* (4620)

Wickson, E. J. The "smut" fungus, *fumago salicina*. (1st rept. Board state hortic. comm. Cal., 1882, p. 91-94, fig.)

Figures *fumago salicina* and describes how it is an indication of the presence of scale insects [*coccidae*] because it grows upon their sugary secretions scattered on plants *G: D.* (4621)

[Wilder, Burt Green.] List of scieniific publications. 4 p., 24 × 16, t 17 × 9.4.

List of 88 papers on scientific subjects, including a number on *araneae*, by B. G. Wilder, professor in Cornell university; reprinted from *The Cornell review* for April 1885. *G: D.* (4622)

Wilder, Burt Green. A spider's engineering. (Pop. sci. mo., May 1873, v. 3, p. 112-113, 39 cm.)

Account of how spiders bridge chasms and streams by sending out a line of silk in the wind. *G: D.* (4623)

Willard, S: Wells. Migration aud distribution of North Ameaican birds in Brown and Outagamie counties. (Trans. Wisc. acad. sciences, arts, and letters, 1881-1883, v. 6, p. 177-196.)

On page 193 the author gives a list of 23 insectivorous birds, with notes on their times of arrival, and considers how food-supply influences the date of migration of birds. *G: D.* (4624)

ENTOMOLOGICAL ITEMS.

A NEW BEE-ENEMY.—According to a correspondent of the *Magdeburger zeitung*, quoted by Dr. Ferdinand Rudow in *Societas entomologica*, *Tabanus bovinus* attacks and kills the honey-bee (*Apis mellifica*) much in the same manner as *Asilus* does.

MR. Albert Koebele, for some time stationed at Alameda, Cal., as an agent of the Division of entomology, U. S. Department of agriculture, has sailed for Australia. His object is to study the parasites of the Cottony-cushion scale, *Icerya purchasi*.

TYLER TOWNSEND. Our correspondent, now assistant in the Division of entomology, U. S. Department of agriculture, who has written formerly over the signature "C: H: Tyler Townsend," informs us that he has decided to drop the given names "C: H:", and to be known hereafter as "Tyler Townsend."

METAL-CUTTING BEETLE.—Mr. F. W. Devoe, in a paper in the July numero of the Journal of the New York microscopical society, describes how *zopherus mexicanus*, a beetle commonly known in Central America under the name "makeche," eats through pewter. Figures of the mouth-parts of the beetle are given.

CHANGE OF TITLE.—The Correspondenzblatt des Entomologishen vereins "Iris" zu Dresden will hereafter appear under the title "Deutsche entomologische zeitschrift, heraus. gegeben von der Deutschen entomologischen gesellschaft. Lepidopterologische hefte, herausgegeben von dem Entomologischen vereine "Iris" zu Dresden."

VITALITY OF THE LARVA OF DERMESTES.—At the meeting of the New York microscopical society, 4 May 1888. "Mr. F. W. Leggett announced the death of his larva of *Dermestes*, which had withstood, for five months and twenty days, solitary confinement in a closed cell, and had subsisted during that period upon its own cast skins, having moulted five times."

EFFECT OF POISONS ON GYRINUS.—M. V. Brandicott (Bull. mens. Soc. linn. du nord d. l. France, July 1887, v. 8, p. 296), in a review of a paper by M. Charles Richet (Revue scientifique, 1886, v. 37, p. 10–17, 44–49) says:

Gyrinus natator, hatched in a solution of 0.25 per cent of atropin, were better developed and lived longer than others hatched in distilled water.

Adult *Gyrinus* put in poisoned solutions died at the end of 24 hours in veratrin, strychnin, and cinchonin; after 5 days in atropin, and after 12 days in morphin.

POISON-APPARATUS OF THE MOSQUITO. My former notes on this subject (*Science*, 26 August, 1887; *Proceedings of the American Association* 1887) require amendment in the following respects: (1) the poison-fang is simple, being in fact the hypopharynx, as was suspected by Dimmock; (2) the paired branches of the poison-duct run backwards into the prothorax; (3) the secreting glands are in two paired systems, one system in each side of the prothorax. Each system consists of three trifoliate glands, the mid-gland being poisonous, the lateral ones salivary; the three ductules uniting into the branch of the poison-duct of its own side. The other details are as before described. G. MACLOSKIE (*Science* 21 September, 1888, v. 7, p. 144).

RHYNCHOPHORA. Lieut. Thomas L. Casey continues his descriptions of new North American coleoptera in the Annals New York academy of sciences, 1888 v. 4, p. 229–296. In the introductory pages, referring to his collection of Pacific coast beetles, the author says, "it has been my special aim to obtain as large a series as possible of every species, for the purpose of studying variation, and these series have already proved one of the greatest aids in estimating the validity of closely allied forms" It is to be regretted that this quotation cannot apply to the *rhyncophora*, a group where large series are particularly important. Fifty-five new species are described. twenty-five are uniques and of forty-four less than four specimens were at hand when the descriptions were drawn up. Though stated, p. 229. as "issued August

1888" the paper was not received until October.

NON-DEVELOPMENT OF A WING IN MELITAEA.—A few days ago I captured, in this locality, a specimen of *Melitaea minuta*, Edw. which had the normal appearance except in one respect—that the right lower-wing had failed to expand more than to a very sligh degree, and presented just such an appearance as the wing of a ♀ *Orgyia antiqua*. There can be no doubt that this malformation was due to an abnormal coalescence of the walls of the veins of the wings, and their occlusion in consequence—adding another case to the many already known in which what is quite abnormal and pathological in one species is normal in another; for the so-called apterous females of certain moths may well be supposed to have descended from winged forms, and to be, in fact, perpetuations of a condition which was once as truly pathological in them as it is now in *Melitaea*. The extraordinary variety of *Ocneria dispar*, which has the lower-wings notched, and breeds true in captivity (Entomologist, 1878, p. 170, fig.) is probably of like nature, and further illustrates this phenomenon.—T. D. A. COCKERELL, in *Ent. mo. mag.*, Sept., 1888, v. 25, p. 93.

BUTTERFLIES OF NEW ENGLAND. From a prospectus dated Cambridge 1 October 1888, we note the speedy publication of Mr. Samuel H. Scudder's Butterflies of New England. The sample sheets accompanying the prospectus show a handsome page of imperial octavo size printed in clear type with liberal margins. The work will be fully illustrated with 96 plates of which 40 or more will be colored; 17 will be devoted to butterflies, 22 to the early stages, 33 to structural details in all stages of life, 2 to parasites, 19 maps and groups of maps and 3 portraits. A novel and interesting feature is the illustration of the North American distribution of the species upon a separate colored map. The plan of the work includes an introduction treating of the general structure of butterflies in their different stages and he naturet of their metamorphoses, a chapter on their classification, an account of the embryology of one of the common species and the internal anatomy of another. The descriptions will include not merely the perfect form, but when possible the egg, caterpillar in all stages and the chrysalis. Under each species will be given, so far as possible, accounts of the secondary sexual peculiarities, particularly of the scales; the general distribution of the insect, and its special distribution in New England; its haunts and comparative abundance; its selection of places in which to deposit eggs, and the manner of oviposition; the food-plants habits, and nests of the caterpillar; the number of broods and seasons of the insects; its winter life; the habits and characteristics of the flight of the butterfly, with its attitudes when alight; its dimorphism, and other variations; its enemies and its protection from them; and under each species, a list of the points on which additional light is needed as hints for the future observer. The hymenopterous and dipterous parasites attacking the eggs and caterpillars of our butterflies are described by Mr. L. O. Howard and Dr. S. W. Williston.

At first intended to embrace only the butterflies known to occur in New England or its immediate confines, it has been extended so as to include in the descriptions and histories some account of all the butterflies of North America east of the Mississippi, excepting such as are found only in the unsettled parts of Canada or south of Kentucky and Virginia.

The work will be issued in twelve monthly parts beginning with November 1888, each part will contain 8 plates and about 144 pages of text. It will be sold only by subscription for the complete work—$5.00 per part payable on issue, or $50.00 for the whole work if paid before 1 January 1889.

Payments may be made by Draft on New York or Boston, or by Domestic or International Postal Money Order to Samuel H. Scudder, Cambridge, Mass., U. S. A.

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CONTENTS:

ADVERTISEMENTS 122
CONTRIBUTION TO A KNOWLEDGE OF THE AUTUMN LIFE-HISTORY OF CERTAIN LITTLE-KNOWN APHIDIDAE — *Clarence Moores Weed.* 123-134
THE PIONEER PAINTER OF NORTH AMERICAN INSECTS — *Hermann August Hagen* . 134-135
NOTES ON THE LARVAL STAGES OF SAMIA CYNTHIA — *Caroline G. Soule* . . 135-136
TWO EUROPEAN WEEVILS NEW TO THE UNITED STATES — *Samuel Henshaw* . 137
HIBERNATION OF THECLIDI — *Samuel Hubbard Scudder* 137
REARING LEPIDOPTERA — *Caroline G. Soule* 137
PROCEEDINGS OF SOCIETIES — *Cambridge Entomological Club* 138-139
BIBLIOGRAPHICAL RECORD, NO. 4625-4697 140-143
ENTOMOLOGICAL ITEMS 144

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(See PSYCHE for Oct.-Dec. 1884, v. 4, p. 223).

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Separates which are often thrown into the waste-basket, as useless, as too small for preservation, as duplications of parts of serials, or as valueless, are respectfully solicited. The friends of the Club are also asked to send a copy of newspapers in which they have published articles or notes on entomological subjects. If these notes are anonymous, the author's name will be acceptible information.

The accessions to the library of the Club had reached the number of 1643 at the end of last year (1887).

Direct all papers for the library to

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PSYCHE.

CONTRIBUTION TO A KNOWLEDGE OF THE AUTUMN LIFE-HISTORY OF CERTAIN LITTLE-KNOWN APHIDIDAE.

BY CLARENCE MOORES WEED, COLUMBUS, OHIO.

I doubt whether our present knowledge of any of the larger families of American insects is in a more chaotic and deplorable state than that relating to the *aphididae*. Though much has been written concerning these insects, comparatively few species have been described in more than one or two of their several forms; and with a few notable exceptions, almost none of the authors who have described species have attempted to trace their seasonal life-histories. Doubtless this condition of things is due largely to the obscurity surrounding the subject, and the imperfect knowledge of the economy of the group both in this country and Europe, as well as to the difficulty of preserving specimens in satisfactory condition for study. The recent researches of Lichtenstein, and Kessler in Europe, and of Riley, Forbes, and others in this country, have given us, however, a substantial working basis for the tracing of the life-histories of these insects, and our knowledge ought hereafter to make more satisfactory progress.

This paper presents a part of the results of field work during the autumn of 1887 on species which have heretofore been very little studied, and about whose autumn life-histories nothing has been recorded. I am under obligations, for many favors received, to my coworkers in the Illinois State Laboratory of Natural History, especially to the Director, Prof. S. A. Forbes, under whose general instructions the investigations have been carried on.

APHIS CORNIFOLIAE FITCH.

This species was first described by Dr. Fitch, in 1851, in the Fourth report of the regents of the University of New York (p. 65), from apterous females found on *Cornus paniculata*. The description is very brief, and as the date of collection is not given we have no means of knowing whether his specimens were oviparous or viviparous, though they were probably the latter. So far as I can learn the species has not since been recognized, except by Prof. Oestlund who says that it is rather

common on the dog-wood in Minnesota.* Whether the specimens described below belong to Fitch's species or not I can only conjecture, but as it is the only *Aphis* I have found upon this plant I refer it to this species.

My attention was first called to this insect by finding the winged viviparous females establishing colonies of sexed individuals on the leaves of dog-wood about the middle of October. The insects had evidently migrated to the shrubs under observation either from other shrubs of the same kind or from some other kind of plant for there were no indications of their having developed where they were found. They occurred at the same time and in the sames ituations as *Schizoneura cornicola*. In fact the autumn life-history of the two species seems to be identical, except that the males of the latter are apterous while those of the former have wings. The eggs of the two species are laid in the same situations and are indistinguishable. Fully developed males and females were observed 24 October when some of the latter were ovipositing on the twigs; and all three forms were taken as late as 10 November.

Winged viviparous female ("*pseudogyna pupifera*†").

Wing expanse	6.40 mm.
Width of body	.68 mm.
Length of body	1.83 mm.
" " antennae . .	1.41 mm.
" " cornicles . .	.23 mm.
" " cauda	.11 mm.

Head black, with frontal and post-ocular tubercles well developed. Prothorax black with prominent lateral tubercles. Meso- and metathorax black, somewhat shining. Abdomen green with a row of marginal sub-circular black spots, two transverse spots of same color on dorsum in front of cauda, and a similar quadrangular spot at anus, and just in front of it on ventrum; also occasional small scattered spots on both surfaces. Anterior legs dull yellowish-brown, with coxae, articulations of femora and tibiae, tips of tibiae, and tarsi, dusky. Middle and posterior legs same, except that femora are more or less dusky throughout. Cornicles long, blackish, cylindrical. Cauda dark yellowish-brown. Tegulae greenish-brown. Insertion of wings yellowish. Costal nervure blackish. Cubitus light yellow. Stigma blackish. Posterior nervures brown. Antennae long and slender. Joints I and II short, subequal; III nearly as long as IV + V, and slightly longer than VII; pores distinct; IV and V subequal; VI shorter than any except I and II; VII a little shorter than III. Rostrum yellowish-brown, reaching second coxae.

Described from six specimens taken 24 October 1887, on under side of leaves of *Cornus sanguinea* and *C. sericea*, with colonies of young of the oviparous form about them.

Winged male.

Wing expanse	5.00 mm.
Width across thorax. . .	0.44 mm.
Length of body	1.60 mm.
" " antennae . .	1.20 mm.
" " cornicles . .	.14 mm.
" " cauda . . .	.10 mm.

* Fourteenth Rept. State geol. Minn., p. 47.

† Lichtenstein, "Les pucerons. Monographie des aphidiens," p. 150.

Head and thorax black; abdomen dull yellowish-brown, becoming black in older specimens. Eyes dark. Antennae dusky-brown; minutely tuberculous; with many pores. Joints I and II subequal in length; III longest, shorter than IV + V; IV and V subequal; VI about one-half as long as V; VII comparatively short, about equal to V, rough and not tapering, with two setae at tip. Cornicles long, dusky, cylindrical, roughened. Legs hairy; anterior pair yellowish-brown with coxae, articulation of femora and tibiae, tip of tibiae, and tarsi dusky; middle and posterior pairs yellowish brown, with coxae, band on middle of femora, tips of tibiae and tarsi dusky. Cauda broad, brown with curved stiff hairs on lateral and posterior margins. Rostrum reaching middle coxae, yellowish-brown. Tegulae yellowish-green; insertion of veins, costa, and cubitus yellowish-brown; stigma olive brown.

Described from two living specimens taken on leaf and twig of *Cornus sanguinea* 10 November 1887. The genital organs of one were exposed.

I have not been able to prove that these males develop along with the oviparous females from the migrating winged viviparous form, and would not be surprised if they were found to develop on the same plants as the latter, and fly to the colonies of the oviparous form, as has recently been proven to be the case with the hop plant-louse (*Phorodon humuli* Schrank).

Oviparous female.

Length of body . . .	1.30 mm.
Width of body	0.63 mm.
Length of antennae . .	0.57 mm.
" " cornicles . .	0.06 mm.
" " cauda . . .	0.08 mm.

Green, with a glaucous bloom; somewhat flattened, widest at middle and tapering both ways. Cornicles and margin of cauda, dusky; sub-quadrangular dusky spot on anus. Eyes reddish-brown. Antennae slender, light yellowish-brown, with dusky tips; 6-jointed, I and II short, III long, IV two-thirds as long as III, filament long. Rostrum light yellowish-brown with dusky tip; reaching posterior coxae. Legs light yellowish-brown, tarsi with dusky tips; coxae greenish; posterior tibiae distinctly swollen. Cauda hairy.

Described from one specimen taken in act of ovipositing in axil of twig of *Cornus sanguinea*, 24 October 1887.

Of many other specimens examined the only perceptible difference was in the depth of coloring of the body, the older specimens becoming more or less brownish.

Egg.

Elongate oval. 0.95 mm. long, 0.23 wide. Green when first deposited but becoming black by exposure.

Described from a specimen just laid by the female mentioned above. Probably it would have shrunk some after being laid.

Aphis Sp. on Amarantus albus.

On 19 October 1887, I found a species of *Aphis* very abundant on a plant of *Amarantus albus* growing near one of the university barns. So far as I could see the species was rep-

resented only by wingless males and oviparous females, which abounded on the under surface of the leaves. Many pairs were mating, and many of the females were laying eggs on the under surface of the leaves, especially along the midrib. The eggs were of the normal form, light colored when first extruded and becoming dark on exposure. About a fortnight later when the plant had been killed by frost the aphides were abundant in the rubbish beneath the plant and some of them had penetrated the soil about the roots. Both forms were still abundant. A few had wandered to a neighboring plant of some species of *Polygonum*.

I find no mention of any aphid infesting *Amarantus albus* in this country, and as the plant is supposed to be naturalized from the tropics it probably does not occur in Europe. In Lichtenstein's* list of host-plants, in which are included all genera known to be infested by aphides, *Amarantus* is not mentioned. Of course this species may also occur on some other plant, but I have found nothing like it in extensive and careful collecting this fall. But although it is probable that the species is undescribed I prefer to leave it unnamed (at least until the other forms can be obtained) rather than run the risk of uselessly burdening the synonymy of the group.

Wingless male.

Width of body	0.50 mm.
Length of body	1.10 mm.
" " antennae	1.20 mm.
" " cornicles	0.08 mm.

Flattened, long and narrow. General color black, mottled with green especially on thorax and abdomen. Head large, black, with a well developed frontal tubercle. Dorsum of thorax black with more or less green on margins. Dorsum of abdomen greenish black, more or less distinctly marked with black transverse patches, especially posteriorly. Cornicles, legs and eyes black. Legs very long with short stiff hairs. Antennae long, robust, roughened with tubercles which are quite large on basal joints, but smaller apically. Rostrum black, reaching cephalic margin of posterior coxae. Ventrum of thorax black, of abdomen green.

Described from one living specimen taken *in copula* on *Amarantus albus*, 19 October 1887.

Oviparous female.

Width of body	0.75 mm.
Length of body	1.60 mm.
" " antennae	0.50 mm.
" " cornicles	0.10 mm.

Body green, with powdery white flocculence, head dusky. Antennae white with dusky tips, roughened by sparse minute tubercles tipped with fine short hairs. Legs whitish, with dusky coxae and tarsi, and more or less dusky on articulations; somewhat hairy. Cornicles nearly color of body. Eyes black. Anus and a quadrangular patch just in front on ventrum, dusky. Rostrum not quite reaching middle coxae; dusky at base and apex.

Described from one living specimen taken *in copula* on *Amarantus albus*, 20 October 1887.

*Les pucerons, p. 76-140.

Another specimen taken *in copula* on the same plant at the same time is slightly yellowish, and has the members (cornicles, antennae, and legs) nearly dusky throughout. A large number of other specimens examined did not differ materially from these two types.

SIPHONOPHORA RUDBECKIAE (FITCH).

This species was first described as *Aphis rudbeckiae* by Dr. Fitch in the Fourth report of the regents of the University of New York (1851, p. 66). The description is very brief and drawn up from winged specimens (said to be males) found upon *Rudbeckia laciniata*, *Solidago serotina* and *S. gigantea*. No dates of collection are given.

In the Proceedings of the Entomological society of Philadelphia for December, 1862 (vol. 1, p. 298) Mr. Walsh describes winged male and female specimens of an aphid found on *Silphium perfoliatum* and on an undetermined *Cirsium* which he doubtfully identifies as *Aphis rudbeckiae*. Certain discrepancies as to color between his specimens and those of Fitch are pointed out. No dates are given.

In Bulletin no. 2 of the Illinois State laboratory of natural history (1877, p. 4) Dr. Cyrus Thomas includes this species in his list of *aphidini* referring it however to the genus *Siphonophora*. The host plants mentioned are *Rudbeckia laciniata*, *Ambrosia trifida*, and *Solidago serotina*. No descriptions are given.

The species is next mentioned by Mr. J. Monell (Bull. U. S. geol. surv., vol. 5, p. 21), who records eleven host-plants, and remarks that the species is probably the commonest of all American aphidians. No life-history details are mentioned.

Again in the Eighth report of the state entomologist of Illinois (p. 49-50) Dr. Thomas gives a full description of the winged viviparous female (though whether the summer or autumn form we cannot tell) and records the occurrence of a green variety, but makes no mention of the sexed forms, nor of the method of hibernation.

The only other important mention of the species that has come to my notice is found in Professor O. W. Oestlund's recent list of the *aphididae* of Minnesota (op. cit., p. 20) where it is said to be found abundantly throughout the season on *Solidago serotina* and *Silphium perfoliatum*. In discussing the apterous males of an allied species (*S. frigidae* Oestlund) the author states: "Wingless males have been observed in both of the above mentioned species"—*S. rudbeckiae* and *S. ambrosiae*, but he describes neither of them, and omits to state whether the sex was ascertained by dissection or field observations. I describe below a winged male, of the sex of which there can be doubt, so that this is another species in which apterous and winged males have been observed. I watched carefully for apterous males but found none. It is to be hoped that in order to establish the fact beyond a doubt the two forms of this sex may be found in the same or adjoining colonies.

My observations upon the species began about the middle of October 1887, when I found the winged viviparous females (*pseudogyna pupifera*) establishing colonies of sexed individuals upon the leaves and stems of various *compositae*, especially, *Solidago* and *Lactuca*. Although the red specimens were by far the commoner, the green variety mentioned by Dr. Thomas was frequently seen. The first specimens seen *in copula* were taken on 18 October, and the first eggs were found on the stem of *Lactuca canadense* on 28 October, in company with oviparous females. On 9 November, a careful examination was made of many old plants which had previously been infested by the lice (as shown by the cast skins), but no living specimens nor eggs were found. The roots and the earth about the roots was also examined with like result. Two days later however the oviparous females were found abundantly on the under leaf-surface of many young plants of *Lactuca* and *Muhlenbergia*, where they were depositing eggs freely. Hence I concluded that the occurrence of eggs on the stems of old plants is exceptional, and that the normal habit of the species is to deposit the eggs on the young plants of such biennials or perennials as it infests.

Winged viviparous female (*pseudogyna pupifera*).

Expanse of wings	7.6 mm.
Width of body (across thorax)	0.9 mm.
Length of body	3.0 mm.
" " antennae	3.2 mm.
" " cornicles	1.0 mm.
" " cauda	0.3 mm.

Head dark reddish-brown, shining. Prothorax of same color. Meso- and metathorax slightly darker, shining. Abdomen nearly black with a slight greenish tinge, shining. Ventral surface greenish black. Antennae long, tapering, black except basal joint, which is unicolorous with head; with rows of rather sparse hairs. Joint I short, large; II small; III long, tuberculate; IV and V subequal, each nearly as long as III; VI very short, about ⅓ as long as V; VI-VII very long, slender. Legs long, hairy; distad of middle of femora brownish-black, proximad dull greenish- or yellowish-brown. Cornicles very long, black, cylindrical, with flange at tip. Cauda long, greenish. Rostrum greenish with dusky tip, reaching second coxae. Tegulae green. Insertion of veins yellowish green. Costa brown; cubitus yellowish; stigma greenish; other veins brown.

The depth of coloring of the body varies considerably. One specimen examined was very dark, another quite light.

Described from two specimens taken on *Lactuca canadense* 25 October 1887, establishing colonies of young.

Winged male.

Wing expanse	6.8 mm.
Width of body	0.8 mm.
Length of body	2.4 mm.
" " antennae	4.0 mm.
" " cornicles	0.4 mm.
" " cauda	0.2 mm.

Dull yellowish-brown, slightly darker on dorsum of thorax and central parts of ventrum. Antennae black, slightly brownish at base. Legs very long, black, except coxae, trochanters

and proximal portions of tibiae yellowish. Cauda long. Cornicles long, black, contracted at middle, dilated at tip. Basal wing-veins and tegulae light yellowish. Beak reaching posterior coxae, yellow at base, becoming brownish toward apex.

Described from one specimen taken *in copula* on *Solidago*, 18 October 1887.

Oviparous female.

Width of body	1.2	mm.
Length of body	3.0	mm.
" " antennae . .	4.0	mm.
" " cornicles . .	0.7	mm.
" " cauda . . .	2.5	mm.

Above clear reddish-brown, slightly darker on thorax. Cauda light yellow, with a few rather long hairs. Cornicles black, long, large at base and slightly tapering apically. Antennae blackish, very long, with sparse stiff hairs. Under surface much like upper. Rostrum dark brown, reaching to anterior margin of posterior coxae. Legs very long; coxae unicolorous with under surface; femora and tibiae light brown (very much lighter than body) with black tips; tarsi black. Abdomen large.

Described from one specimen (having ten well developed eggs in the abdomen) taken on *Lactuca* or *Mulgedium*, 22 October 1887.

SCHIZONEURA CORNICOLA (WALSH).

Whether the species described by Walsh under the above name is the same as the European *Schizoneura corni*, or not, I cannot tell, nor am I certain that the forms described below are the same as those found by Walsh, whose description (Proc. Ent. soc. Phil., vol. 1, p. 304) is brief and was drawn up from dried specimens. There is every probability, however, that they are the same. Walsh doubtfully refers the species to the genus *Eriosoma*, and states that "numerous [winged ?] individuals unaccompanied by any flocculent matter, and so far as I recollect by larvae, occurred in September, on the lower side of the leaves of the red osier dogwood."

Thomas quotes Walsh's note and refers the species to *Schizoneura*, but does not mention having seen the insect.

My observations upon the species began about the middle of October, 1887, when winged viviparous females were abundant upon the under surface of the leaves of *Cornus sanguinea* and *C. sericea*, and were just beginning to establish colonies. No other form was present, which led me to think that these winged individuals had migrated from some other species of plant, as had they been developed on *Cornus* there would probably have been indications of it — either cast skins or belated colonies. These winged individuals were occasionally seen upon other plants, but their presence was evidently accidental, as none of them were establishing colonies.

On 24 October, the dogwood leaves were covered with colonies of the three forms, — winged viviparous females (*pseudogyna pupifera*), apterous males, and oviparous

females. Many of the latter were mating, and some of the oviparous females had begun to deposit eggs on the twigs about the buds. From this time on the winged individuals became less numerous until, by 11 November, they were only rarely found. At the latter date, however, many of the males and females were still on the leaves and twigs.

Winged viviparous female (*pseudogyna pupifera*).

Expanse of wings . . .	6 mm.
Length of body . . .	2 mm.
Width of body	8 mm.
Length of antennae . .	9 mm.

Black above, except anterior and lateral margins of abdomen, and in many specimens more or less of posterior portion. Beneath black, except prothorax and abdomen (save a black patch in front of anus) which are dull, whitish-brown. Rostrum black, except a more or less distinct lighter patch near base, hairy, reaching posterior coxae. Legs robust, black, except a short, brownish space at base of anterior femora; thickly provided with brown hairs. Antennae robust, beset with brown hairs. Joints I and II, short, smooth; III, long, with row of tubercles on its outer ventro-lateral surface; IV and V subequal, with tubercles as on III; VI, a little longer than V, excavated on its outer lateral surface about two-thirds distance from base. Wing veins mostly brown. Stigma brownish, with interior portion darker.

Described from many specimens taken 24 October 1887, on leaves of *Cornus sanguinea* and *C. sericea*, where for some time previous they had been very numerous, founding sexed colonies. Usually occurring on the under surface.

Apterous male.

Width of body	0.05 mm.
Length of body	0.89 mm.
Length of antennae . .	0.47 mm.

Body and members, brownish or brownish-black, with numerous brown hairs. Eyes black. Body flattened, long and narrow, with nearly parallel sides. Antennae half as long as body. Joint I, short, swollen; II, small; III, longest; IV and V, subequal; the latter excavated on its apical lateral surface. Legs long, robust, same color as body. Rostrum robust, reaching anterior margin of posterior coxae.

Described from several living specimens (part taken in *copula*), from *Cornus sericea*, collected 24 October 1887.

Oviparous female.

Width of body . . .	0.50 mm.
Length of body . . .	1.14 mm.
Length of antennæ . .	0.35 mm.

Green, or greenish-brown, slightly darker anteriorly. Shape, elongate-oval; sparsely clothed with brown hairs. Eyes blackish. Antennae green, slightly darker apically; joint III longest, V slightly swollen in middle. Rostrum robust, green, darker at tip, reaching anterior margin of posterior coxæ. Legs unicolorous with body, dusky apically.

Egg.

Elongate oval, 0.56 mm. long, 0.2 wide.

Green at first, becoming black by exposure. Deposited on bark, in and about the axils of buds and small branches.

Described from many specimens on *Cornus sericea*, 24 October 1887.

CALLIPTERUS DISCOLOR. MONELL.

This handsome species was described by Mr. Monell, in 1879, from winged specimens found in Missouri, on the under side of the leaves of *Quercus bicolor*, in May. So far as I know it has not since been treated of.

I first noticed the species about the middle of October, when winged viviparous females were establishing colonies of sexed individuals on the under surface of the leaves of the bur-oak (*Quercus macrocarpa* Mx.) on the university farm. I was unable to describe this form at once, and when I next visited the trees, 28 October, only the sexed individuals were present.

As noted below, the eggs are deposited on the leaves, and very likely the young hatch in spring and crawl upon the twigs before the leaves fall, as it is well known that many oak leaves, especially on young trees, do not drop until quite late in spring.

Winged male.

Expanse of wings	2.60 mm.
Width of body (across prothorax)	0.45 mm.
Width of body (" mesothorax)	0.65 mm.
Length of body	2.00 mm.
Length of antennae	1.35 mm.

Light yellow, with black markings. Head above subtriangular, black. Pronotum black, with an oblique yellowish line on each side near the margin, and a transverse line (interrupted by two black spots) on the posterior margin. Meso- and metanotum, black, with a yellow stripe on each margin. Dorsum of abdomen, yellow, with a series of transverse dark stripes along the middle, a row of dark spots on each lateral margin, and numerous smaller scattered spots on its surface. Ventral surface of head dusky green; of prothorax, yellowish; of meso- and metathorax, dark green; of abdomen, yellowish, with transverse dark stripes, especially towards anus. Eyes red. Rostrum reaching slightly caudad of caudal margin of anterior coxae; greenish-yellow with base dusky. Legs yellowish, more or less dusky, with fine hairs. Antennae dusky brown or black, darker apically, long and tapering. Joints I and II subequal in length, I being larger transversely; III long; IV two-thirds as long as III; V slightly shorter than IV; VI and VII subequal, both shorter than V; VII slender. Membrane of wing, whitish. Tegulae and basal portion of veins, yellowish. Wing-veins brownish black, with more or less clouding of the membrane along their margins, especially where they terminate. Stigma wide, dusky at lateral and caudal margins, but whitish in middle and front.

Described from three living specimens taken on under leaf-surface of *Quercus macrocarpa*, 29 October 1887.

The depth of coloring of the body and members varies considerably with the age of the specimen.

This form is developed along with the oviparous female on the leaves of various oaks. Late in October 1887, I examined great numbers of colonies and frequently saw the pupae of this winged form on the leaves; and in several instances I saw the winged adults emerging from the pupa-skin.

Oviparous female.

Length of body	2.00 mm.
Width of body (above anterior coxae)	0.50 mm.
" " " (above middle coxae)	0.74 mm.
" " " (across middle of abdomen)	1.00 mm.
Antennae	1.20 mm.
Cornicles	0.05 mm.

Light yellow; dorsum with four longitudinal rows of mostly subquadrangular spots of a yellowish-brown color, two of the rows being on the lateral margins, and the other two on each side the meson. On the abdomen are various smaller spots of the same color. Under surface immaculate. Body provided with numerous rather long brown hairs, having slightly enlarged truncate tips, distribution on dorsum corresponding to that of the colored spots. Head and prothorax subquadrangular; former with a small tubercle surmounted by a hair in front on each side of the meson. At posterior margin of prothorax body suddenly widens and expands to middle of abdomen, when it begins to contract posteriorly and ends in a long tapering ovipositor. Cornicles yellow, short, large. Eyes yellow, with a red spot on their lower surface. Antennae slender, tapering, yellowish-brown with dusky articulations and tips. Joints I and II as usual; III very long, equal to IV + V; IV and V subequal; VI short, half as long as V; VII also short, slightly longer than VI. Legs robust, dusky yellowish-brown, with many short hairs. Tarsi black. Rostrum short, reaching just back of anterior coxae, yellow, with black tips.

Described from three living specimens from *Quercus macrocarpa*, 27 October 1887.

The depth of coloring of this form varies much. Many specimens have a distinct reddish tinge, others are more or less brownish, and still others (apparently those which have recently passed the last moult) are green. The depth of color of the members varies with that of the body —those specimens which are green having legs and antennae also more or less green, those which are brown having legs and antennae brownish, etc.

Egg.

Elongate, subcylindrical; 0.47 mm. long, 0.17 mm. wide. Green or yellowish when first deposited, but becoming darker on exposure. Deposited by the side of the midrib or secondary vein on the under surface of the leaf, stuck in among the long leaf hairs.

Described from two specimens taken on leaf of *Quercus macrocarpa*, 28 October 1887.

The long ovipositor of the female no doubt aids greatly in inserting the egg in its proper position close to the midrib

among the dense pubescence that covers the under leaf surface. If the abdomen terminated as does that of those species which oviposit on bark, the egg would often be caught on the ends of the hairs and blown away.

In order to determine the numbers of eggs laid by a single female I crushed several specimens in alcohol on a glass slide and counted the number of well developed eggs contained within the abdomen. The greatest number found was 25, and the least 10; the other specimens containing 10, 13, 10, 20, 15, 11 and 13 respectively.

CHAITOPHORUS VIMINALIS Monell (?).

Mr. J. Monell has described,* under the name *Chaitophorus viminalis* wingless and winged specimens of a plant louse on *Salix lucida* and *S. babylonica*. No dates are given but probably both these forms were viviparous.

Late in October I found sexed individuals of a species of *Chaitophorus* abundant on some bushes of *Salix alba* in the university arboretum. It was evidently too late for the viviparous forms, as none were found. Hence I refer these specimens to *viminalis* with some hesitancy. They are not *C. smithiae*, however, as the nectaries are short and thick, and Monell states that in the latter they are long and flaring at the tip, a character which places the species (*smithiae*) in the genus *Cladobius*.

Winged male.

Expanse of wings . . .	4.3 mm.
Width of body	0.6 mm.
Length of body . . .	1.50 mm.
" antennae . .	1.15 mm.
" cornicles . .	0.05 mm.
" cauda . . .	0.08 mm.

Black, somewhat shining; abdomen greenish-black. Body and members furnished with rather long brown hairs. Antennae black, except base of third joint which is brownish; with a few long brown hairs. Joints I and II subequal; III long, not quite equal to IV + V; IV and V subequal; VI short, rather thick; VII long, slender, nearly three times as long as VI. Cornicles short, greenish-brown. Rostrum reaching slightly back of anterior coxae, greenish black. Legs blackish, with tibiae pale brown. Cauda broad, expanding from base to middle. Wing membrane whitish. Tegulae and base of wing-veins yellowish-brown, as are the costa and cubitus; stigma, and other veins brownish-black.

Described from one living specimen taken on under leaf-surface of *Salix alba*, 3 October 1887. Genital organs were extruded.

Oviparous female.

Length of body	1.6.5 mm.
Width of body	0.9 mm.

Dull yellowish-brown or blackish. Body and appendages furnished with numerous long brown hairs. Eyes dark. Antennae dusky brown or blackish, robust. Joints I and II subequal; III shorter than IV + V; IV slightly longer than V, which is slightly longer than VI; VII rather thick, slightly longer than III. Legs robust, dusky yellowish-brown or blackish. Rostrum robust, unicolorous with body, reach-

*Bull. U. S. geol. surv., vol. 5, p. 31.

ing anterior margin of posterior coxae. Cornicles very short, unicolorous with body.

Described from many specimens taken in company with young, and winged males on under leaf-surface of *Salix alba*, 31 October, 1887.

Egg.

Oval; 0.6 mm. long, 0.3 mm. wide. Yellow when first extruded. The only specimens seen were deposited on the under leaf-surface, but I surmise that they may be usually deposited about the buds, though after considera ble search I have found none so placed.

Described from five specimens taken, together with oviparous females, on the under leaf surface of *Salix alba*, 8 November 1887.

THE PIONEER PAINTER OF NORTH AMERICAN INSECTS.

BY HERMANN AUGUST HAGEN, CAMBRIDGE, MASS.

Marc Catesby was born in 1679 or 1680 and died 23 Dec. 1749, at London. His early inclination to study natural history was much suppressed by his residing remote from London, I do not know where. Having relatives in Virginia he decided to go there, to study plants and animals foreign to England. He arrived there 23 April 1712 and returned to England in 1719. By generous friends he was induced and urged to go again to America, and arrived 23 May 1722, at Charleston, S. Carolina. He employed the first year collecting, describing and figuring plants and animals. After living nearly three years in Carolina, Georgia and Florida he went to the Bahamas, visiting Providence and some adjacent islands. As he was not bred a painter he asks indulgence for some faults in his pictures. Returning to England in 1726 and wishing to publish the result of his labors he tried to teach himself the art of etching. As far as I understand the notices given in the preface of his book (out of which are taken the above facts) he colored the plates himself. He was a Fellow of the Royal society. It is today rather difficult to understand how the publication of such an expensive work was at all possible, as the list of the subscribers contains only 165 names. He was induced by his patrons to study the birds rather than describe promiscuously insects, and other animals. Therefore he was not able to delineate a great number of insects. Those given are, as far as I know, the first North American insects figured after living specimens and published colored. The figures are recognizable, though sometimes not good. The descriptions are short and prove that he was not an entomologist. Nevertheless the work of a pioneer should not be entirely forgotten.

Below I give the title and a list of the insects figured: The natural history of

Carolina, Florida and the Bahama Islands . . . by Marc Catesby. London, Innys, fol. Vol. 1, 1731; Vol. 2, 1743, tab. 200. Appendix 1748; tab. 20.

Edition 2 by George Edwards. London, 1754.

" 3 by George Edwards. London, 1771.

Vol. 1. pl. 8 Gryllotalpa columbia Scudd.
35 Ecpantheria oculatissima S. & A.
66 A fly; not recognizable.

Vol. 2. pl. 83 Papilio turnus Linn.
84 Attacus luna Linn.
86 " cecropia Linn. and cocoon.
88 Danaus plexippus Linn.
89 Oedipoda carolina De Geer.
90 Attacus cecropia Linn.
91 A. polpyhemus Cram.
94 Eacles imperialis Drury. Larva.
95 Thais rumina Linn.
96 Deiopeia bella Linn.
97 Papilio turnus Linn.
100 " marcellus B. & L.

Appdx. pl. 4 Thalessa atrata Fabr.
5 Pelopoeus caeruleus Linn.
10 f. 3 Pulex penetrans Linn.
4 A beetle I have not been able to identify.
5 Blatta americana Linn.
9 " ? not known to me.
7 Silpha peltata Catesby.
11 Canthon laevis Drury. Phanaeus carnifex Linn.
13 Sphex cementaria Drury.
15 Mutilla coccinea Fabr.?

NOTES ON THE LARVAL STAGES OF SAMIA CYNTHIA.

BY CAROLINE G. SOULE, BROOKLINE, MASS.

The eggs of *Cynthia*, except a very few, did not turn green before hatching. Those laid first, 10th May, hatched on 31st May, giving 21 days for the egg-period; but those laid last, 18th May, hatched on 3d June, giving 16 days for this period.

The larvae ate very little till the middle of the second day, and did not eat the egg-shell at all, unless they ate the bits removed to let them out.

When very young they seemed to be troubled by the excrement, which clung to the anal shield, instead of dropping in the usual manner, and the larvae had a way of seizing the excreta with their mouths, pulling them free, and then giving them a quick jerk which threw them over the edge of the leaf. There was a little silk visible all through the first stage, where the larvae moved.

About 120 eggs I gave away, of the remaining 221 only two failed to hatch.

I gave most of the larvae tulip-tree (*Liriodendron tulipifera*), leaves, which they ate eagerly.

With some I tried lilac, pear, *Pyrus japonica*, walnut, and horse-chestnut, and at first they seemed to like them, except the horse-chestnut, but the second day they only nibbled at these leaves, and several larvae died.

To others I gave *Lonicera tartarica* and bittersweet (*Solanum dulcamara*,) and these they ate fairly well, but did not grow as large as those on tulip-tree, though they moulted at the same times.

Moulting began on 7th June, seven days from the hatching of the first eggs.

The second moulting of the first-born larvae began on 9th June, only two days from the first moulting, and before the last larvae had finished their first moulting.

The 3rd moulting began 14th June, five days from the second, and before the last larvae had accomplished their second moulting.

The 4th moulting began on 17th June, before the last larvae had finished the 3rd moulting. The green color appeared for the first time, and the anal shield was bright orange edged with pale blue. Several died in moulting, and for no apparent cause.

On the night of 30th June two larvae began spinning, and by four P. M. on 1st July their cocoons were thick, while several others had begun to spin, making their larval life just one month.

The largest of these larvae weighed ½ oz. each and were three inches long, or lacked a trifle of that length. The smallest, those fed on *Lonicera tartarica* were one and a quarter inches long and weighed very little—less than my letter-scales would weigh; their moults corresponded with those of the full-grown larvae, and they reached the same coloring and markings, except the orange anal shield, with the blue edge, and the other blue markings.

Their development seemed to be retarded as well as their size stunted by the food-plant.

Although the dwarfs moulted at the same time with the large larvae of the same age, the two which survived the last moult fed until the last part of July, when one died, and the other began to spin 31st July. After various futile attempts he gave it up, and, on 8th Aug., pupated on the bottom of the tin, without any trace of silk about him. The pupa was bright yellow, turning brown gradually.

None of the larvae fed on tulip-tree made as heavy cocoons as those fed on *Ailanthus*, from which these were bred.

PSYCHE.

CAMBRIDGE, MASS., NOV.-DEC., 1888.

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TWO EUROPEAN WEEVILS NEW TO THE UNITED STATES.

Mr. F. C. Bowditch has collected *Sciaphilus muricatus* and *Strophosomus coryli* in Brookline, Massachusetts. Thirteen specimens of the first mentioned species were beaten from balm of gilead, *Populus balsamifera*, and about the same number of *Strophosomus coryli* were obtained by sifting. Sometime ago Mr. H. B. Bailey sent me, for identification, four specimens of *S. coryli* which he had collected on yellow birch, *Betula lutea*, at South Orange, N. J. In Europe this species has been recorded from birch (*Betula*), beech (*Fagus*), hazel (*Corylus*), oak (*Quercus*), pine (*Pinus*), and the Scotch broom (*Cytisus scoparius*). Dr. W. G. Dietz identified the species for Mr. Bowditch.

Samuel Henshaw.

HIBERNATION OF THECLIDI.

How many of our *Theclidi* pass the winter in the egg state? Last year I found a wintering egg of *liparops* on a shadbush (*Amelanchier canadensis*), and this year that of *titus* on wild cherry in each case in a protected spot on one of the terminal twigs. Several species of European *Theclidi*, at least five or six of the nine species, are reported to winter as eggs, while of the others perhaps one or two winter as chrysalids. Mr. Saunders, then of London, now of Ottawa, years ago obtained the caterpillars of *acadica* and *edwardsii* in June before any butterfly is on the wing, so that it is probable that these species also winter in the egg; and Mr. Hulbert, of New Britain, last year found caterpillars of *calanus* during the last of May, so that that species is presumably also in the same category. But I should be glad of further facts regarding them. On the other hand *damon* (*smilacis*) certainly winters as a chrysalis, and probably all the species of *Incisalia*, *I. augustus*, *niphon* and *irus*, to judge from their early appearance only. How is it with *melinus?* I suspect this also winters in the chrysalis state, but should be glad of any information that can be given.

Samuel H. Scudder.

REARING LEPIDOPTERA.

In the early times of my entomological work I found much difficulty in obtaining moths from pupae formed "in the ground"—as represented by kegs, deep flower-pots, &c. Three or four years ago I accidentally hit upon a much easier and more successful way of obtaining such pupae, and imagines. A *Sphinx drupiferarum* larva was forgotten in a close tin, and pupated perfectly without a particle of earth. After finding this pupa, Miss Eliot and I experimented with other *sphingidae*, *Datana ministra*, *Anisota senatoria* and other larvae, with the result that of those we allowed to pupate in the ground more than half failed to give the imago, while of those pupating in the close tins very few failed.—Of some kinds every one emerged. With one or two exceptions all those in tin emerged earlier than those in earth, though kept in the same room.

As this plan has been in successful operation for three or four years, and is much simpler and easier than the earth-plan, I venture to recommend it "to all whom it may concern."

Caroline G. Soule.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

(*Continued from p. 70.*)

12 Nov. 1886.—The 123d meeting of the club was held at 61 Sacramento St., Cambridge, 12 Nov., 1886. In the absence of the president, Mr. S: H. Scudder was chosen chairman. The secretary announced the withdrawal from the club of Mr. Thaddeus William Harris. As Mr. Harris was a member of the executive committee a ballot was taken and Dr. George Dimmock elected to fill the vacancy.

Dr. G: Dimmock read a letter from Mrs. M. L. Owen, of Springfield, with reference to a curious case, exhibited a few meetings ago, which resembled that of one of the trap-door spiders.

He then showed specimens of what appeared to be a wingless species of *chalcidae* from Cambridge, and also a specimen of *Grapta interrogationis*, with its chrysalis, which emerged 10 Nov.

Mr. S: H. Scudder showed a photograph of Dr. Asa Fitch taken from an ambrotype.

Mr. Scudder then read a letter from Miss Adele M. Fielde, in which she described some of her observations on insects in China.

He then exhibited drawings of *Papilio philenor* and *P. chalcas*, by Mr. J. H. Emerton.

10 Dec., 1886.—The 124th meeting was held at 61 Sacramento St., Cambridge. In the absence of the president, Mr. S: H. Scudder was chosen chairman.

The Secretary announced the withdrawal from the club of Mr. G: H. Parker.

Nomination no. 143, that of Mr. Paul Howard Cheney of Cambridge, for active membership was presented by Messrs. Child and Dimmock.

Dr. G: Dimmock read a paper on the "Reproduction of lost limbs in Coleoptera," in which he gave a somewhat detailed account of experiments which he had tried of amputating the legs of larvae of *coccinellidae* and the subsequent reproduction of these limbs. The paper was prefaced by an account of what had been recorded by previous observers upon the reproduction of lost limbs in insects, and will be published in full in *Psyche*.

Mr. S: H. Scudder remarked upon an article by Graber in which that author arrives at the conclusion that the antennae are the only organs sensitive to smell.

He then read extracts from Plateau's "Une expérience sur la fonction des antennes chez la blatte" in which he concludes that the palpi as well as the antennae are capable of the perception of odors.

Mr. Scudder then showed "The butterflies of India," by G. F. L. Marshall and de Nicéville, and briefly reviewed the work.

14 January 1887.—The 125th meeting (11th annual meeting since incorporation) was held at 61 Sacramento St., Cambridge, 14 January 1887. In the absence of the President, Dr. G: Dimmock was elected to the chair.

The annual report of the secretary, treasurer and librarian were presented and accepted, that of the treasurer having been previously examined and approved by the auditors.

The librarian reported 207 accessions to the library for the year 1886, making the total number of accessions 1562.

Nomination no. 143 was acted on and Mr. Paul Howard Cheney elected to active membership.

The club next passed to the election of officers for 1887, which resulted in the election of the following: president, J. H. Emerton; secretary, Roland Hayward; treasurer, B. Pickman Mann; librarian, G: Dimmock; members at large of executive committee, George Dimmock and S: H Scudder.

Mr. B: Pickman Mann was chosen editor of *Psyche*, with power to choose his associates.

The annual address of the president, Prof. S. A. Forbes, was presented by the secretary. The address was upon "The present state of our knowledge concerning contagious insect diseases." (See *Psyche*, v. 5, p. 3-12.)

Mr. S: H. Scudder then showed some plates from a work which he has in preparation upon our New England butterflies.

11 FEB. 1887.—The 126th meeting was held at 61 Sacramento St, Cambridge, 11 Feb., 1887. The meeting was called to order at 8 P. M., the president, Mr. J. H. Emerton in the chair. Nine members were present.

The secretary, in behalf of the executive committee, stated that a contract had been drawn up between the club, as party of the first part, and Mr. B: Pickman Mann, as party of the second part. Under this contract, Mr. Mann was to assume the publication of *Psyche*. The contract was then read, accepted, and the secretary authorized to act as assistant treasurer as per contract.

The secretary was empowered to levy an extra assessment of fifty cents on all resident members.

Mr. S: H. Scudder read a paper on the injuries to plants by white ants. Maple trees have been quite seriously injured by *Termes flavipes*. Mr. Scudder found many of the geranium cuttings in a greenhouse attached to Mt. Auburn cemetery injured by these depredations. The white ants enter the cut end and eat away all but the rind. They have there just the conditions which they most need. Mr. Scudder recommends, as a preventative, that the trays in which the cuttings are placed should be lined with slate tiles. (See *Can. entom.*, v. 19, p. 217-218.)

Mr. S: H. Scudder exhibited under the microscope some of the androconia or scales peculiar to the male sex, which are found in the *hesperidae*. These occur in one or two places on the fore wing, according to which of the two groups into which he has divided the skippers they belong. In one of these groups, the *hesperidi*, comprising most of the larger skippers, they are found in a special overlapping fold of the wing membrane, on the costal border; in the other, the *pamphilidi*, into which the bulk of the smaller species fall, in a surface dash crossing the base of the median nervules. In the interior of each is the mass of slender, more or less thread-like scales, which in our New England *hesperidi* take the form of curving or chain-like, slender, twisted ribbons, or thread-tipped, tapering scales; the homologous structures of the *pamphilidi* are the pointed scales or short pile forming the velvety interior of the discal streak. Outside of all, and partially or wholly concealing the others, are the large tenuous cover-scales, many times larger than the ordinary scales of the wing, with entire margin and concave or tortuous surface. While along the edges of the fold of the *hesperidi*, or in definite spots about the stigma of the *pamphilidi*, are two other sets of scales—a modification of those found along the veins of the costal area—slender, nearly uniform, one, two, or three-toothed, and generally of a very dark color; and secondly, the very minute boat-shaped scales, which are apparently intermingled indefinitely with the others.

The identity of the elements which characterize these two forms of male adornment in the skippers has not before been recognized, but there is an additional and independent character in the *pamphilidi* in the frequent presence below the area of the dash proper of a large patch of partially erect fan-like scales.

Mr. Scudder also called attention to the difference between the New England species of *Thanaos* without pre-marginal white spots on the fore-wing and the others, in that the curving hairs of the interior of the costal fold are replaced in the former: in one case, *brizo*, by twisted ribbon-like scales; and in the other, *icelus*, by thread-tipped, tapering scales, very different in general appearance from the curving hairs and wholly lacking the basal crook of these. (See *Psyche* v. 5. p. 86-88.) Remarks were made by various members.

Mr. S: H. Scudder then exhibited the inflated larvae of various diurnal lepidoptera.

Dr. G: Dimmock showed a living plant-louse, *Siphonophora pelargonii* hatched 2 Feb., which had neary completed its full growth.

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A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard; S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

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Mode of spraying pear-trees with arsenical insecticides. *G: D.* (4697)

ENTOMOLOGICAL ITEMS.

TWO SUGGESTIONS TO STUDENTS OF ENTOMOLOGY.—Some years ago we used the following method for studying the venation of the wings of small lepidoptera. We have told it since to many friends, but believe it has not been published. It is in some respects preferable to the so-called "Dimmock process" and particularly as a time-saver. It is also in this respect preferable to denudation with a brush. The wing is removed and mounted upon a slide in Canada balsam, which should be preferably rather thick. The slide is then held over the flame of an alcohol lamp until the balsam spreads well over the wing. Just as it is about to enter the veins, however, the slide is placed on ice, or, if in the winter time, outside the window for a few moments. This thickens the balsam immediately and prevents it from entering the veins, which remain permanently filled with air and appear black with transmitted light. With a little practice one soon becomes expert enough to remove the slide and cool it at just the right time, when the scales will have been rendered nearly transparent, by the balsam while the veins remain filled with air. We have done this satisfactorily not only with *tortricidae* and *tineidae*, but with noctuids of the size of *Aletia* and *Leucania*. The mounts are permanent, and we have some which have remained unchanged since 1880. Professor Riley had for some years before this been in the habit of mounting wings in balsam, in which, of course, the scales cleared after a time. With aphids and coccids, which are covered with an abundant waxy secretion which can not be readily brushed away, we have adopted the plan of melting the wax. We place the insect on a bit of platinum foil and pass it once over the flame of the alcohol lamp. The wax melts at a surprisingly low temperature and leaves the insect perfectly clean for study. This method is particularly of use in the removal of the waxy cocoon of the pupae of male *coccidae*, and is quicker and more thorough than the use of any of the chemical wax solvents which we have tried. L. O. HOWARD, *in Insect Life*, Nov., 1888, p. 151-152.

HABITS OF TERMITES.—Mr. P. H. Dudley, in an article read before the New York microscopical society and published in its Journal for July 1888, describes some of the habits of white ants, especially of those found on the Isthmus of Panama. He writes of a slide of woody fibre, or pulp, from a termites' nest:

"The wood has been so thoroughly comminuted, that it is doubtful whether it could be recognized as woody particles under the microscope, unaided by chemical reagents.

"A study of similar slides throws some light upon their work of destruction on many kinds of wood, in structures.

"The particles of wood do not have as sharp, angular corners as one would naturally expect of chips cut from solid wood; on the other hand, they seem as tho made from softened wood, or that undergoing decay. The particles have more the appearance of little pellets than cuttings, which in some measure is doubtless due to the form, motion and pressure of the mandibles. After they are cut the next step is not clear. Some cuttings serve as food for the insects, as they are found in the alimentary canal. Others are mixed with some substance which causes the particles to adhere, and then are fashioned into the walls, which form the galleries of the nest.

"The walls are built up of a number of thin layers of the cuttings, give evidence of being prepared with great care, and become quite hard and solid. A fragment thrown into water does not disintegrate by soaking, and after many hours it requires trituration to separate the particles.

"On turning a piece, nearly all of the substance is consumed; the residuum, however, being much more than the natural ash of the wood—some clay is present. Phloroglucin gives a reaction, showing some lignin is still in the woody particles. In many of the specimens I found fragments of the mycelium of a fungus, and upon examining the stick of yellow pine, 6×11 inches, which contained the nest, found it was in process of decay at the point of attack." . . .

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CONTENTS:

ADVERTISEMENTS 146
NOTES ON PROTECTIVE RESEMBLANCES IN SPIDERS—*George F. Atkinson* . . 147–148
DESCRIPTION OF EGGS AND LARVA OF APATELODES TORREFACTA — *Caroline G. Soule* 148–149
ELECTRIC LIGHT CAPTURES—*John Hamilton* 149–150
EFFECT OF CONSANGUINITY IN LEPIDOPTERA—*George Dimmock* 150–151
PACKARD'S ENTOMOLOGY FOR BEGINNERS—*George Dimmock* 151
INACCURATE FIGURE OF A BUTTERFLY'S EGG—*S. H. Scudder* 152
MACULATION AND PUPATION OF SMERINTHUS EXCAECATUS—*Holmes Hinckly* . 152–153
PROCEEDINGS OF SOCIETIES—*Cambridge Entomological Club* 153
BIBLIOGRAPHICAL RECORD, NO. 4698-4725 154–155
ENTOMOLOGICAL ITEMS 156

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(See PSYCHE for Oct.-Dec. 1884, v. 4, p. 223).

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B: PICKMAN MANN,
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The librarian of the Cambridge Entomological Club calls attention to the desirability of preserving in the library of the Club as complete a series of entomological publications as it is possible to collect. It is especially desirable to preserve the transient literature of the subject—separates, small pamphlets and newspaper articles—and the librarian will be pleased to receive single copies of the daily papers, scientific journals, magazines, or agricultural papers, which contain entomological articles. These papers are preserved and catalogd, and, because they are overlooked by large general libraries, are just the kind of material that should be preserved in a special entomological library. Any one who has sought for some of the best of the agricultural journals of the western states in libraries will appreciate any effort made to preserve journals of this sort.

Separates which are often thrown into the waste-basket, as useless, as too small for preservation, as duplications of parts of serials, or as valueless, are respectfully solicited. The friends of the Club are also asked to send a copy of newspapers in which they have published articles or notes on entomological subjects. If these notes are anonymous, the author's name will be acceptible information.

The accessions to the library of the Club had reached the number of 1643 at the end of last year (1887).

Direct all papers for the library to

CAMBRIDGE ENTOMOLOGICAL CLUB,
Cambridge, Mass.

PSYCHE.

NOTES ON PROTECTIVE RESEMBLANCE IN SPIDERS.

BY GEORGE F. ATKINSON, COLUMBIA, S. C.

A very interesting case of unintentional mimicry by *Argiope riparia* came to my notice a few years ago. A villager in western North Carolina found a web of this species in his garden. He was struck by the peculiar zig-zag line across the web and imagined he could read WAR! WAR!! WAR!!! It attracted considerable attention among the inhabitants of the town. A notice of this was published in the village paper and copied in several of the state papers. It created considerable consternation among the superstitious ones of the inhabitants, who regarded the portents of war with fear. It is interesting to reflect how, if ignorance and superstition belonged to our people as to some of the peoples of ancient countries, this incident might have given us a "*Sacred* spider," and thus afforded it the protection which these gods were wont to receive.

Beside the case mentioned by Hentz* where *Synemosyna formica* resembled ants when crawling on the blades of grass and corn, I have frequently noticed this species (probably the same) running on the bare ground in the hot sun, in roads and paths, mimicking almost to perfection certain of the smaller members of the *mutillidae*.

Tetragnatha frequently mimics elongated dark blotches on grass stems. I have often seen them, when frightened, leave their web and clinging to a grass stem place their bodies close to the stem, stretch their anterior legs above, and their posterior ones below. The body being dark and the legs green, the spider was well protected.

Thomisus celer remains principally on yellow flowers, and once I found a greenish variety of this species on golden-rod (*Solidago*), the flowers of which, not yet open, were greenish.

The pellets made of silk and bits of leaves, and hung in a row on the web of *Epeira caudata*, in many cases have proportionately more or less of the dark and white intermingled, according as the dark and white spots on the spider predominate.

In the case of *Acrosoma spinea*, which makes an oblique web and hangs on the underside of this, the white dor-

*Spiders of the U. S., p. 73.

sum against the light of the sky as a background might afford it a protection from enemies below; and the dark of the venter against the dark background of the earth, a protection from those above it.

Many such cases can be regarded more clearly as protective since we now know that insects probably do not see *form*, but *color* and *movement*.

DESCRIPTION OF EGGS AND LARVA OF APATELODES TORREFACTA.

BY CAROLINE G. SOULE, BROOKLINE, MASS.

A female found at Nonquitt, Mass., on 13 July 1888, laid a mass of pale green eggs, circular, flat on both top and bottom, translucent, and looking like tiny gelatine lozenges, 1.5 mm. in diameter. 20 July, the embryo could be seen — with a lens. Five days later the eggs had become opaque and of a sordid yellowish white color. 26 July, the young larvae hatched, being a trifle less than 6 mm. long, covered with long white hairs, and having a few dark ones near the head and the anal shield.

The head, body, feet, and props were pale yellow, without marks.

The hair was dense, long over the anal end, shorter over the middle, and still longer on first three segments. The body became green with food. The larvae rested on both sides of the sassafras (*Sassafras officinale*) and ash (*Fraxinus*) leaves, and moved *very* fast. A slight jar sufficed to make them fall from the leaf and drop by a silken thread.

When touched they curled up like the arctians. They drank greedily, and ate their cast skins.

Those Miss Ida M. Eliot had ate beach-plum (*Prunus maritima*) and oak (*Quercus*).

Some sent to Miss Emily M. Norton ate wild-cherry (*Prunus*).

2 Aug. The larvae molted, becoming even whiter and "fluffier" than before, with a dorsal line of black dashes, and a dark pencil on the tenth segment. A few had gray hairs over the head.

5 Aug. They molted for the second time;—as before with the addition of a gray pencil on the second and third segments.

Feet and props were conspicuously white.

10 Aug. Third molt. 25 mm. long, body green; feet and props white; head sordid white; hair very long and silky, and from each dorsal dash sprung a short black pencil.

A lateral and subventral line of black arrow-heads appeared.

One larva became bright yellow with the pencils tan-colored with black tips, and one was of a soft gray with black pencils.

15 Aug. Fourth molt.

The venter was black, and the props were black with white tips. On first and second segments, the arrow-heads were replaced by vertical black dashes, extending nearly to the dorsal line.

The yellow one came out with the body black, the hair Maltese-gray, lighter over the head; pencils darker gray with black tips. The gray one was like it.

26 Aug. Adult larva, 51 mm. long, densely covered with long silky hair—varying in color from pure white to deep gray. Pencils almost black with black tips. Head gray.

Body hardly to be seen but black wherever visible. Props black with red tips. Feet black.

27 Aug. Three shed all their pencils and long hair, emptied themselves, and crawled rapidly about as if hunting for good places to pupate. Rotten wood and bark were provided, but no attention was paid to them, and no signs of spinning were found.

30 Aug. The pupae appeared, bright apple green, with three abdominal rows of gray dots, at first, but they soon became of a uniform mahogany color, very shining and bright, about 19 mm. long.

Some were in close tins, and some in a paste-board box, but those in tin pupated first.

The larvae fed on sassafras grew faster and larger than those fed on ash, and molted and pupated earlier.

As the larvae grew older they chose older leaves, in preference to young and tender ones, as food.

This I have noticed with all my larvae this year.

ELECTRIC LIGHT CAPTURES.

BY JOHN HAMILTON, ALLEGHENY, PA.

The reputed rarity of an insect is frequently owing to its ability to conceal itself and a want of knowledge in the collector regarding its habits, whereas it may be really abundant. This is exemplified in the instances of *Calosoma scrutator* and *C. willcoxi*. During near twenty years of collecting here I only took a single living specimen of each; Mr. Klages who has collected near half that time — and carefully, was not more successful, nor were several amateurs whose collections were seen. Yet all this time there were thousands of these insects about us as we now know. This year (1888) the evenings of 9, 10 and 11 May were warm, temperature 60° to 65° F. During one hour of each of these evenings I picked up from the platform of an open pavilion in one of our parks in the centre of the city, to the corners of which powerful electric lights were suspended, ninety ♀ and thirty ♂ *Calosoma scrutator;* one hundred and ten ♀ and twenty-six ♂ *C. willcoxi*. Three weeks of low tem-

perature and great humidity succeeded during which time no beetles were observed, but on 2 June it became warm again and so continued, and these same beetles again occurred, but much less abundantly, and continued till 23 June, after which no more were observed. Mr. Klages collected during a few evenings at the electric lights suspended opposite the large plate-glass windows of some of the stores in Pittsburgh with such success, that he sent to Europe seven hundred specimens of *C. willcoxi* and three hundred of *C. scrutator* (his correspondents there write for more!).

Where these beetles came from is a matter of speculation, but it is scarcely supposable that all were raised in the city. The number of individuals must have been immense as the collecting done by Mr. Klages and myself was only at a few places, and for a very brief period, and that in face of the small boy, etc., etc., difficulty. Of *Calosoma calidum*, which has always been moderately abundant, not over a dozen specimens were taken at light the whole season. *C. externum* yielded five specimens, *Diplochila major* four specimens, *Polymoechus brevipes* six specimens, *Erycus puncticollis* four specimens, none of which had been taken elsewhere.

To show the great distances to which water beetles fly, I may state that at the same place on the evenings of May mentioned I picked up twenty-three ♀ and four ♂ *Cybister fimbriolatus*, one ♂ *Dytiscus fasciventris*, twenty-four ♀ and seven ♂ *Hydrophilus triangularis*. The great hemipteron, *Belostoma americanum* could have been taken by the peck. The nearest point to the river is more than three-fourths of a mile.

The number of coleoptera and insects of all orders that are attracted to the electric lights in these cities is beyond computation.

EFFECT OF CONSANGUINITY IN LEPIDOPTERA.

The late M. Pierre Millière contributed an article, entitled. "Des résultats variés que donnent chez les lépidoptères les accouplements consanguins," to *Il naturalista siciliano* for May 1887, which contains facts interesting to the biologist. He writes:

"When, among lepidoptera bred in captivity, pairings continue from one generation to another, without interrupting the series of consanguineous unions by the introduction of new blood, there occurs for each species a particular result, in such manner that the consanguineous and successive unions not only do not produce, for the lepidoptera in general, identical results, but, on the contrary, each species conforms to an influence which is peculiar to itself."

As illustrating this variety of effect of consanguineous unions in lepidoptera the author obtained fertile eggs for two successive years from *Hadena solieri;* the third year only about half the eggs hatched, while the fourth

year, of an abundance of eggs from different females, none hatched. Ninety eggs of *Spilosoma zatima*, obtained after a consanguineous union failed to hatch. Of *Crocallis dardoinaria*, which has a single annual brood, the first year 480 eggs, and the second year about 500 eggs, all proved fertile, but the third year not an egg hatched out of a large number obtained.

Eucrostis indigenata and *Cidaria vittata* failed to produce fertile eggs with consanguineous parents.

He adds: "On the contrary *Nemoria aureliaria* raised in captivity, has not, during more than ten years, ceased to be fertile, both for spring and fall generations."

"I could multiply these examples, but the facts which I give suffice to show the interest which pertains, from the point of view of the establishment of specific characters for lepidoptera, to the verifying that, in each species, the continuance of the reproductive power varies when the pairings are between consanguineous individuals and without the introduction of new blood.

As *Crocallis*, *Eucrostis*, *Cidaria*, and *Nemoria* all belong to the *geometridae*, the variability of reproductiveness in close-breeding in a single family is very marked. Experiments on such biological subjects need multiplication. *G: Dimmock.*

PACKARD'S "ENTOMOLOGY FOR BEGINNERS."

In A. S. Packard's "Entomology for beginners" appears, for the first time from an American publisher, possibly the first time in the English language, a work on general entomology which presents the subject in accordance with modern scientific progress. Instead of being a systematical classification and enumeration of insects to which the study of their anatomy, physiology, and biology is subordinated or appended, as is generally the case with entomological works, the systematic part of this work occupies only about one-third of its pages, and is sprinkled with allusions to habits, and to internal as well as to external anatomy. The great number of species of insects make it necessary to fill a larger proportion of the work with details of classification than would be the case in considering any other division of the animal kingdom. The chapter devoted to "insects injurious and beneficial to agriculture" is short, but contains as many details, proportionally to the size of the whole book, as seems necessary in a general entomological work.

Of special importance and value are the chapters devoted to modes of collecting, preserving, and rearing insects; to their dissection; and to the cutting and mounting of sections of insects, whole insects, or their organs, for microscopical study. Here Professor Packard has brought together a good number of methods from widely separated sources. The directions for dissection and for microscopical research must prove very useful to the younger students in America who are beginning to turn their attention from unwieldy entomological collections to the comparative anatomy and histology of insects. At first reading of Professor Packard's work, I was inclined to believe that these methods should have been revised and more thoroughly combined in his work, but a second examination convinced me that the nearer each description retained the words of the originator of the process the better, leaving the student or investigator to select for himself the method or parts of methods best suited to his special requirements.

The list of periodicals and works on entomology which occupies ten pages, near the end of the work, is well selected, but there is a lack of uniformity in typographical matters in this list, and in the numerous bibliographical references in the body of the work. Slight inaccuracies of statement are noticeable in places in the work, which is not wonderful when its scope and extent are considered, but it will prove most useful not only to beginners but to all entomologists.

G: Dimmock.

PSYCHE.

CAMBRIDGE, MASS., JANUARY 1889.

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INACCURATE FIGURE OF A BUTTERFLY'S EGG.

I have always wondered where the figure of the egg of the vanessid butterfly *polychloros* of Europe came from, as it was manifestly incorrect, although it has been extensively copied, and so far as I know, never found fault with. Dr. Riley has just lent me the volumes of Sepp's Nederlandsche Insecten, and there I find the culprit. It is figured as having the shape of a pear or perhaps better of a gourd, being much constricted and produced at the top. In Sepp's other figures of eggs which are laid in batches, the clusters are figured likewise, as for instance in the case of *urticae*, but here this is not done, and I am strongly under the impression that Sepp, whose accuracy is well known, must have mistaken the egg of some other insect for that of *polychloros*, the eggs of which are laid in clusters and resemble those of *antiopa*, both in their manner of deposition and in their form, so closely that they can hardly be distinguished.

S: H. Scudder.

MACULATION AND PUPATION OF SMERINTHUS EXCAECATUS.

In Lexington, Mass., 17 Aug. 1888, I confined a large female *Smerinthus excaecatus* in a breeding cage. In a few hours she began to lay, attaching, singly or in small clusters, some eighty roundish, light-green eggs to the netting with which the cage was covered. I then removed them to a glass jar, to prevent the escape of the young larvae—should they hatch—through the meshes of the netting. On 25 Aug. the eggs began to hatch, and the larvae ate freely of willow (*Salix*), with which I supplied them. The first molt was taking place 2 Sept., and the second 11 Sept. Up to this time I had noticed no red spots, but after this they appeared on less than one-half of the specimens then alive. As is the case amongst most of the *sphingidae*, I believe, while young, the mortality of my *S. geminatus* and *S. excaecatus* has been great, so that at the completion of their second molt less than half had survived, though I had taken much pains to keep their jar clean and well supplied with fresh twigs of willow.

The red spots, besides being present in only a part of my specimens, were unequally distributed in these, some having both the stigmatal and dorsal, while others had only the stigmatal spots.

About 25 Sept. the greater part of these larvae stopped eating and settled to rest in the bottom of their jar. As they were apparently very far from being fully grown, having reached a size perhaps half or two-thirds of that which should normally be attained by these larvae, I was disinclined to consider their behavior a preliminary to pupating. After a few hours, however, to my great surprise, they pupated, forming of course very small chrysalids. The interesting question in regard to these larvae is this:— did I overlook two molts, owing to the habit that this larva has of eating all of its cast-off skin but the head, or did they pupate when they had accomplished only two of their orthodox number of molts? The former supposition seems to be rendered unlikely from the fact that at the time of pupating they were so far from having attained their normal size, not to speak of the improbability

of two molts escaping my frequent and somewhat careful scrutiny. The latter supposition seems to be favored by the circumstance of the lateness of the season when the parent moth was taken, as it is rare to find one so late as 17 Aug. Several of the pupae soon sickened and, on being handled, readily collapsed, showing that they lacked the robustness of normal specimens.

As to the distribution of the red spots, I find, on consulting William Buckler's work "The larvae of the British butterflies and moths," that the three British specimens of the genus *Smerinthus* (*S. ocellatus*, *S. populi*, and *S. tiliae*), all show the same disparity as does our *S. excaecatus* in regard to number and distribution.

Holmes Hinkley.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

(*Continued from p. 139.*)

11 March 1887.—The 127th meeting was held at 61 Sacramento St., Cambridge, 11 March 1887. The meeting was called to order shortly after eight, the president, Mr. J. H. Emerton in the chair.

The additions to the library were announced by the librarian.

Mr. S: H. Scudder exhibited specimens of *Melitaea harrisii* which had been kept in a cyanide bottle since June 1886 and called attention to the curious fading of the black in the wings.

He then showed a photograph of Major John LeConte taken from a miniature.

Mr. Scudder read a letter dated 16 January, 1887, from Miss Adele M. Fielde of Swatow, China, containing six larvae. These were found "on the level surface of the coarse sand which covers the bottom of an aqueduct, under an inch or two of fresh, clear, running water: little structures which resembled a tiny cave with a gray gauze awning stretched in front. They were to be seen in scores, always opening up stream, the gauzy entrance arched at the top and having a span of an eighth to half an inch. There was usually a buttress of sand in the rear, which in some cases had been swept away. The largest of the larvae found was five-eighths of an inch long. It burrowed in the sand, forming the floor of its cave, and stretched its head out of its furrow, appearing to feed on what had been caught in the delicate roof of its den. Its head and the three thoracic segments, each of which bore a pair of jointed legs, were a glossy reddish-brown, while the following eight segments were, in some specimens bright green, in others opaque gray. The terminal portion, a translucent white segment, bore two cylindrical prongs, ending in a tuft of long setae and having a brown hook on the under side, like the hooks on the feet. Nine segments, beginning with the mesothoracic, bore on the ventral surface tracheal gills, which issued from the body in a single stem and then branched irregularly into finger-shaped processes. The arrangement of these gills is much like that of the setae on the ventral surface of the earthworm, as far as I could discover without a dissecting microscope, in four longitudinal rows. The two outer ones being the larger. (I am not certain whether there were really four rows or whether the branching gave the appearance of four rows.) No antennae were visible. The eyes are small and close to the mouth. The metathoracic appears to coalesce with the first abdominal segment, but differs in color. There are many may fly larvae flitting about the little structures, probably uninvited guests at the banquet spread out in the net of their host. The species is probably allied to one described by Miss Cora H. Clarke."

(See Proc. acad. nat. sci., Phil. 1888, p. 129-130, pl. 8.)

Mr. S: H. Scudder then showed figures of the fossil butterflies known from America.

Mr. W: Trelease exhibited specimens which he supposed to belong to some species of *coccidae*.

BIBLIOGRAPHICAL RECORD.

Authors and societies are requested to forward their works to the editors as soon as published. The date of publication, given in brackets [], *marks the time at which the work was received, unless an earlier date of publication is known to recorder or editor. Unless otherwise stated each record is made directly from the work that is noticed.*

A colon after initial designates the most common given name, as: A: Augustus; B: Benjamin; C: Charles; D: David; E: Edward; F: Frederic; G: George; H: Henry; I: Isaac; J: John; K: Karl; L: Louis; M: Mark; N: Nicholas; O: Otto; P: Peter; R: Richard; S: Samuel; T: Thomas; W: William. The initials at the end of each record, or note, are those of the recorder.

Corrections of errors and notices of omissions are solicited.

Atkinson, G: F. New instances of protective resemblance in spiders. (Amer. naturalist, June 1888, v. 22, p. 545-546.) (Journ. Elisha Mitchell sci. soc., Jan.-June 1888, v. 5, p. 28-30.)

Thomisus aleatoreus, at rest, imitates with its anterior legs spikelets of grass; *cyrtarachne multilineata*, a new species here described, mimics shells of *helix*. *G: D* (4698)

Atkinson, G: F. Note on the tube-inhabiting spider, *lycosa fatifera* Hentz. (Amer. naturalist, June 1888, v. 22, p. 546-547.) (Journ. Elisha Mitchell sci. soc., Jan.-June 1888, v. 5, p. 30-31.)

On the use of its tube by *lycosa fatifera*. *G: D.* (4699)

California — *Board of state horticultural commissioners.* First report. Sacramento, *state office*, 1882. t. p. cover, 94 p., 24×15, t 18.5 ×11.2. il.

CONTENTS: Officers and members of boards of state viticultural, and of state horticultural commissioners; acts of legislature and quarantine rules of viticultural and horticultural commissioners, for protection of fruit-growing industries of the state; minutes of proceedings of Board of state horticultural commissioners, and minutes of first annual horticultural convention, both series of minutes containing notes on measures against noxious insects; papers (recorded separately under authors' names) by S. F. Chapin, Matthew Cooke, Ellwood Cooper, C: H. Dwinelle, Felix Gillet, W. B. West, and E. J. Wickson. *G: D.* (4700)

Cockerell, Theodore Dru Alison. The orange spot in *nathalis iole*, Bdw [!]. (Can. entom., Aug. 1888, v. 20, p. 156-157.)

States that the orange spot on the wings of *nathalis iole* is liable to fade suddenly. *G: D.* (4701)

Field, E: H. History of a brood of lunas. (Swiss cross, Aug. 1888, v. 4, p. 46-47, 45 cm.)

Account of rearing *attacus luna;* description of different stages. *G: D.* (4702)

French, G: Hazen. Partial preparatory stages of *catocala innubens*, Guen. (Can. entom., Sept. 1888, v. 20, p. 170-172.)

Describes larva and chrysalis of *catocala innubens*. *G: D.* (4703)

Gauckler, H. Lepidopterologische notizen. (Societas entom., 15 Feb. 1886, v. 2, p. 171, 23 cm.)

Contains notice of a pupa of *sphinx pinastri* with a deformed proboscis-sheath, which produced an imago with deformed proboscis. *G: D.* (4704)

Handlirsch, Anton. [Die variabilität und die geographische verbreitung der hummeln.] (Verh. K.-k. zool.-botan. gesells. in Wien, 1888, v. 38; Sitz.-ber., p. 34-36.)

Discusses the geographical distribution of the species of *bombus*, and the variability of the species. *G: D.* (4705)

Harrach, M. Ueber den fang von ameisengästen und deren vorkommen bei den verschiedenen ameisenarten. (Entom. zeitschr., 1888, v. 2: 1 May, p. 14-16, 85 cm.; 1 June, p. 25-26, 70 cm.)

Mode of collecting myrmecophilous coleoptera, and notes on species found in nests of different species of *formicidae*. *G: D.* (4706)

Landois, Hermann. Beobachtung über den verbleib des spinnfadens. (Jahresber. d. Westfäl. provinzial.-vereins für wissensch. u. kunst für 1885, 1886, p. 30.)

The author believes that spiders eat their thread when they reascend it and it disappears. *G: D.* (4707)

Monell, Joseph. A new genus of *aphidae*. (Can. entom., June 1877, v. 9, p. 102-103.) [Rec., 1183.]

Reprint. (Valley naturalist, Jan. 1878, v. 1, p. 2, col. 1, 15 cm.)

Describes *colopha*, a new genus of *aphididae*, for *byrsocrypta ulmicola*, Fitch; literature of the species. *G: D.* (4708)

Ormerod, Eleanor A. Parasites of the "hessian fly" (*cecidomyia destructor*, Say). (Entomologist, Dec. 1887, v. 20, p. 317-318.)

From the parasites of *cecidomyia destructor* in England being Russian, the author concludes that England probably received its *cecidomyia* from the east.

G: D. (4709)

Peckham, G: W. *and* **Peckham**, Elizabeth Gifford. On duration of memory in wasps. (Amer. nat., Nov. 1887, v. 21, p. 1038-1040.)

Separate. 1887. p. 1038-1040. 24×15, t 18×10.2.

Results of experiments to find how long specimens of *vespa maculata* remembered the location of their nests. *G: D.* (4710)

Peckham, Elizabeth (Gifford), *wife of* G: W., *see* PECKHAM, G: W.

Stokes, Alfred C. An old Dutch microscopist and what he did. II. Some of his discoveries. (Swiss cross, July 1888, v. 4, p. 1-3, 70 cm.)

Figures magnified foot of spider, and scales of some insects: describes these and other things seen by Leeuwenhoek. *G: D.* (4711)

Tracy, Mary E. New Jersey butterflies. (Swiss cross, July 1888, v. 4, p. 31, 4 cm.)

List of diurnal lepidoptera seen in April 1888, in Plainfield, N. J. *G: D.* (4712)

VON **Varendorff**, O. Ein käferfang im winter auf dem eise. (Societas entom., 1888, v. 3: 1 May, p. 20, 31 cm.; 15 May, p. 28, 22 cm.)

Mode of collecting beetles on the ice.

G; D. (4713)

Venus, C. Eduard. Ueber varietäten-zucht. (Corresp.-blatt d. Entom. ver. "Iris" zu Dresden, July 1888, v. 1, no. 5. p. 209-210.)

Negative results of experiments upon heterophagic variation of lepidoptera; success in producing variation in *vanessa urticae* by rearing in increased temperature. *G: D.* (4714)

Veron, E. Ueber parthenogenesis bei *bombyx mori*. (Zool. anzeiger, 14 May 1888, v. 11, p. 263-264.)

Denies that parthenogensis is possible in *bombyx mori*. *G: D.* (4715)

Voeltzkow, Alfred. Vorläufige mittheilung über die entwicklung im ei von *musca vomitoria*. (Zool. anzeiger, 7 May 1888, v. 11, p. 235-236.)

Brief outline of the development of *musca vomitoria* in the egg. *G: D.* (4716)

Waters, G: Franklin. Peculiar cocoons. (Swiss cross, June, 1888, v. 3, p. 190, 14 cm.)

Figures a peculiar cocoon of *attacus promethea*.

G: D. (4717)

Waters, G: Franklin. [Sense of taste in birds.] (Proc. Bost. soc. nat. hist., Oct. 1883, v. 22, p. 433-434.)

Abstract, by C: Copineau, entitled, "Remarques sur le sens du gout chez les oiseaux." (Bull. Soc. linn du nord de la France, Feb. 1887, v. 7, p. 219-221.)

A sparrow hawk [*tinunculus sparverius*] is stated to have eaten earth worms [*lumbricus*] and to have developed a taste for caterpillars. *G: D.* (4718)

Webb, Sydney. The elucidation of causes of variation. (Entomologist, Mar. 1888, v. 21, p. 87-89.)

Urges entomologists to keep more complete accounts of meteorology, soil and subsoil, in localities where varieties are taken. *G: D.* (4719)

Weir, J: Jenner. On melanism. (Entomologist, Apr. 1887, v. 20, p. 85-87.)

Defends Lord Walsingham's [T: DeGrey's] view that "dark coloration of lepidoptera from both nigh latitudes and altitudes was of service to them, because in such localities 'they require rapidly to take advantage of transient gleams of sunshine.'" *G: D.* (4720)

Weniger, J. Adolphe. On the sexes of lepidopterous larvae. (Entomologist, Apr. 1887, v. 20, p. 87-88, 2 fig.)

Describes a mode of distinguishing males from females in the later larval stages of some species of *attacus* (e. g., *a. cecropia*); comments on this method by E: B. Poulton follow (p. 88-89). *G: D.* (4721)

White, W: The effect of meteorological conditions upon insect-life. (Entomologist, Sept. 1888, v. 21, p. 217-220.)

Discusses probable effect of the cold, moist weather of July, 1888, in the production of melanic lepidoptera. *G: D.* (4722)

Winston, Eugenia. Wasp and cricket. (Swiss cross, Feb. 1888, v. 3, p. 63, 8 cm.)

Mode in which a wasp drew a cricket into a hole in the ground. *G: D.* (4723)

Wood-Mason, James. Some account of the 'palan byoo' or 'teindoung bo' (*paraponyx oryzalis*), a lepidopterous insect-pest of the rice-plant in Burma, which in the caterpillar state breathes water by means of tracheal gills. Calcutta, *gov't*, 1885. t.-p. + 12 p., 1 pl. 25 × 16, t. 16 × 10,cl.

Describes and figures the larva, pupa and cocoon of *paraponyx oryzalis* a new species of *pyralidae* infesting rice (*oryza*) in Burma; the larva is aquatic and breathes with tracheal gills, the position and nature of which are described. *G: D.* (4724)

Woodworth, C: [W:] *Leucanium hispidum* [!]. (Amer. florist. 1 Dec. 1886, v. 2, p. 149, col. 1, 26 cm.)

Brief account of the habits of *lecanium hesperidum* [corr.] and of the use of kerosene emulsion for its destruction. *G: D.* (4725)

ENTOMOLOGICAL ITEMS.

NECROLOGY. — Since our last necrological notice (PSYCHE, Mar. 1888, v. 5, p. 36-36), news has been received of the death of the following entomologists, or persons who have contributed to, entomological literature: Dr. Guiseppe Bellonci, professor of anatomy in the university of Bologna, d. at Bologna, 1 July 1888, 30 years old. Dr. John Thomas Boswell (formerly known as Dr. Boswell Syme), lepidopterist, d. at Balmuto, Fifeshire, Scotland, 31 Jan. 1888, aged 66. Charles Donckier de Donceel, a well-known Belgian lepidopterist, d. 29 June 1888, at Chératte, near Liège, in his 86th year. Miss M. E. Glanville, economic entomologist, curator of the Albany museum, Graham's Town, South Africa, d. 4 April 1888. Philip Henry Gosse, naturalist, b. at Worcester, Engl., 6 April 1810, d. 23 Aug. 1888, at St. Mary Church, Torquay, England. Asa Gray, professor of botany in Harvard university, who has written numerous articles on fertilization of plants by insects, b. 18 Nov. 1810, in Paris, Oneida co., N. Y., d. 30 Jan. 1888, in Cambridge, Mass. William W. Hill, lepidopterist, of Albany, N.Y., b. 19 Sept. 1833, at Pittsfield, Mass., d. 28 Jan. 1888, at Elizabethtown, Essex co., N. Y. Johann Kriesch, professor of zoology in the Polytechnicum at Budapest, Hungary, and editor of the *Ungarische Bienenzeitung*, d. at Budapest, 21 Oct. 1888, 54 years old. Count August Friedrich Marschall, author of a "Nomenclator zoologicus" and writer on orthoptera, b. 10 Dec. 1804, d. 11 Oct. 1887, at Obermeidling, Austria. Jules Émile Planchon, botanist and student of phylloxera, b. at Ganges, dept. of Hérault, France, in March 1823, d. at Paris, France, 3 April 1888. Henry James Stovin Pryer, a well-known student of the entomology of Japan, b. near Finsbury Square, London, England, 10 June 1850; d. at Yokohama, Japan, 17 Feb. 1888, of bronchial pneumonia. John Scott, writer on hemiptera, b. at Morpeth, England, 21 Sept. 1823, d. in the same town, 30 Aug. 1888. George Robert Waterhouse, coleopterist (father of Charles Owen Waterhouse, also coleopterist), b. at Somers Town, England, 6 March 1810, d. at Putney, Engl., 21 Jan. 1888. *G: D.*

AGRICULTURAL EXPERIMENT STATION REPORTS. — The Cambridge Entomological Club desires to obtain as full sets as possible of all the reports of state experiment stations established under the Hatch bill, in so far as these reports contain entomological matter. Up to the time of writing the librarian has received bulletins from the states indicated by an asterisk below. For the benefit of our subscribers we append a list, as accurate as we can now make it, of the addresses of those stations that have entomologists. We should be glad to receive additions and corrections for this list.

State.	*Entomologist and address.*
Maine.	Prof. F. L. Harvey, Orono.
Vt.	Prof. G: H. Perkins, Burlington.
Mass.*	Prof. C: H: Fernald, Amherst.
N. Y.	Prof. J: H: Comstock, Ithaca.
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Mo.	J. W. Clark, Columbia.
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Ind.	F. M. Webster, Lafayette
Neb.	Lawrence Bruner, Lincoln.
Kans.	Prof. E. A. Popenoe, Manhattan.
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CONTENTS:

ADVERTISEMENTS 158
ON THE OCCURRENCE OF ORGANS PROBABLY OF TASTE IN THE EPIPHARYNX OF THE MECAPTERA (PANORPA AND BOREUS) — *Alpheus Spring Packard* . . 159-164
OBSERVATIONS ON SOME VARIATIONS OF THE MALES IN CLINIDIUM — *Frederick Blanchard* 165-166
SOME NEW COMPARISONS OF PIERIS NAPI AND PIERIS OLERACEA — *Samuel Hubbard Scudder* 166-167
LAC INSECTS—*Hermann August Hagen* 168
MIGRATION OF AGANISTHOS ACHERONTA — *Benjamin Pickman Mann* . . . 168
DURATION OF LIFE IN AN EPHEMERA — *Alpheus Spring Packard* . . . 168-169
PAIRING OF XYSTICUS TRIGUTATTUS — *James Henry Emerton* 169
TROX AT ELECTRIC LIGHT—*Charles William Woodworth* 169
LUMINOUS EGGS OF INSECTS—*George Dimmock* 169-170
PHOSPHORESCENCE OF MYRIOPODS—*George Dimmock* 170
THE MECONIUM OF BUTTERFLIES—*George Dimmock* 170
HOUSEHOLD PESTS—*George Dimmock* 170
MYRMECOPHILISM — *William Trelease* 171-180

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PSYCHE.

ON THE OCCURRENCE OF ORGANS PROBABLY OF TASTE IN THE EPIPHARYNX OF THE MECAPTERA (PANORPA AND BOREUS).

BY ALPHEUS SPRING PACKARD, PROVIDENCE, R. I.

From the observations of Meinert, Forel, Kraepelin and Will anatomical and experimental proofs have been afforded of the existence of organs of taste on the parts of the maxillae near the mouth, and also on the lingua or "tongue" of ants, wasps and bees; while Lubbock, in his recent excellent work "On the senses," etc. of animals, claims that the organs discovered by Wolff in the mouth-parts of the lower hymenoptera, e.g., *tenthredinidae*, *evaniidae*, *chalcididae* and *proctotrupidae* are also those of taste.

I have observed organs such as Will[1] describes and figures (his figs. 1, 8, 8a, 9, 11, 16, etc.), which he calls "geschmacksbecher" and Lubbock translates as "taste-cups," in the mounted preparations of the mouth-parts of the honey bee and a species of *Bombus*, kindly loaned me by Mr. N. N. Mason, of Providence. In the honey bee they are most abundant in the paraglossae situated at the base of the tongue and at the end of the furrow. Each paraglossa bears about 22-27 taste-cups, in my specimen 22 on the left, and 27 on the right paraglossa; on the inside, near the base of each labial palpus, and opposite the middle of the paraglossae are situated a group of exactly similar taste-cups, which are, however, rather like pegs than sunken cups or pits; they are protected in front by a few defensive spinules; and there are about 30 on each side.

In the *Bombus*, the left paraglossa bears about 28 taste-pegs arranged in irregular oblique rows; on the right are 28. On the base of the labial palpi, the taste-cups are less peg-shaped, more like cups, the rods being shorter and smaller while the rim of the cup is more marked. The terminal joint of the maxillae of *Vespa maculata* have no taste-cups, but about 35 taste-rods, which are much longer than those of *Vespa vulgaris* figured by Will.

I have also observed the taste-cups in the epipharynx of the honey bee.

Taste-cups on the epipharynx of

[1] Das geschmacksorgan der insecten. (Zeitschrift für wissensch. zool., 1885 v. 42, p. 674.)

Panorpa debilis Westw?, *and Boreus californicus* Pack.—Having thus become in a degree familiar with the organs so clearly described and figured by Will, I was prepared to look for them in other insects. It was not until I had found them in the epipharynx of *Panorpa* and *Boreus*, that I was aware that other observers had already noticed them. In his historical summary Will states that G. Joseph[2] in 1877 mentions that in almost all orders of insects, but especially in those living on plants, we find at the base of the tongue, in the region of the throat and the palate, little cups, which should be regarded as organs of taste. Künckel and Gazagnaire[3] (1881) found in *Volucella* similar organs on the paraglossae (labella), on the end of the epipharynx and at the beginning as well as throughout the whole extent of the pharynx. Will does not seem to have seen the elaborate plates of these authors in the second part of their great work on *Volucella*, where the mouth-parts of *Volucella*[4] are beautifully figured by Gazagnaire with numerous figures of microscopic sections of the proboscis and of the epipharynx and hypopharynx, including excellent histological details showing the gustatory cups, cells and nerves. The taste-cups we have seen in the insects mentioned below are similar to those figured by Gazagnaire, and, judging by their appearance and position where the fluids enter the mouth, there seems little doubt that these pits or cups, with their projecting rods or fine setae are true organs of taste.

Our own observations are very superficial, no attempt having been made to study the parts histologically, or by microscopic sections, so as to work out the nerves and ganglion cells. We have simply dissected out the parts, placed them for a few minutes in a mixture of carbolic acid, 1 part, and oil of turpentine 4 parts, with a drop or two of dilute liquor potassae. This clears the parts, rendering them transparent, so that they can be at once placed in the animalcule-box and examined under the microscope.

A word or two as to the homologies of the epipharynx may not be out of place. Little attention has been paid to the nature of this organ, and it is most desirable that a careful and comparative study of it be made. Morphologically it is the pharyngeal lining of the labrum and clypeus, and seems to be present in all insects. In the higher lepidoptera (macros) what has been regarded as the labrum is called by Dr. A. Walter[5] the epipharynx. In the hymenoptera it forms a short fold situated under the projecting labrum. What in the mecaptera

[2] Joseph, Gust. Zur morphologie des geschmacksorganes bei insekten. (Amtlicher bericht der 50. Versammlung deutscher naturforscher u. Ärzte in München, 1877, p. 227-228.)

[3] Du siège de la gustation chez les insectes dipteres. Constitution anatomique et physiologique de l'épipharynx et l' hypopharynx. (Comptes rendus, 1881, v. 95, p. 347-350.)

[4] Recherches sur l'organization et le développement des diptères et en particulaire des volucelles de la famille des syphides, part 1, 1875, part 2. 1881, only the plates and their explanations.

[5] Walter, Alfred. Beiträge zur morphologie der schmetterlinge. 1er theil. Zur morphologie der schmetterlingsmundtheile. (Jena. zeitschr., 1885, v. 18, n. s., v. 9.)

we call the parepipharynx is apparently the pale, non-chitinous, sensitive end of the labrum. It is in *Panorpa* a palatal fold or outgrowth, and in *Boreus* it is directly continuous with the labrum. For convenience, therefore, we will call this soft, non-chitinous, whitish highly sensitive fold projecting beyond the labrum the parepipharynx. And here it may be said that a very close relationship appears to exist between the parepipharynx of *panorpidae* and of the microlepidoptera, especially the *tineidae*, and in this point the *panorpidae* are quite unlike the neuroptera as restricted by Brauer and myself, which do not have a parepipharynx. In fact the parepipharynx appears to be mainly developed in the suctorial insects, such as the hymenoptera, lepidoptera and diptera, and also the mecaptera, but is not well developed in exclusively biting insects, which have the mandibles well developed.

Dr. Walter's figure and account of the labrum and epipharynx of *Micropteryx semipurpurella* is of special interest in connection with the structure of the homologous parts in *Boreus*. In the tineid in question, the five-sided or rather triangular, narrow, horny labrum is hollowed out at the end, the hollow being filled by the pale, sub-membranous parepipharynx, which projects out from under the labrum and completes the apex of the triangle made by the two organs collectively. Now the labrum-epipharynx of *Boreus* and *Panorpa*, is rather long, narrow and triangular; in *Panorpa* the labrum ends in a corneous point, and the epipharynx forms two pale, membranous flaps on each side, as seen from above; in *Boreus*, however, the labrum ends in an obtuse point, and in fact appears at first as if hollowed out, as there are two dark thickened mandible-like portions on each side of the labrum, free from setae and sensory pits. The parepipharynx forms a pale whitish, obtusely pointed projection of the end of the labrum, and is not, as in *Panorpa*, divided into lobes extending along the sides towards the base of the labrum.

I regard the structure of the labrum-epipharynx of the mecaptera, and on the other hand the interesting discovery by Walter of the primitive lepidopterous maxilla of *Micropteryx caltella* with the lacinia (the homologue of one half of the "tongue") and the galea, besides the maxillary palpus, as very strong proof of the origin of lepidoptera from mecaptera-like forms. Walter does not state how nearly the shape of the galea of the *Micropteryx* in question corresponds to that of the true neuroptera (in sensu Brauer) but it is noticeable.

To return to the sense-organs developed in the labrum-epipharynx. The sensory organs are of two kinds *i. e.*, taste-cups (Will) and taste-rods, besides tactile hairs and defensive setae, as well as what seem to be "gathering hairs" (Cheshire).

In *Panorpa debilis?* the labrum as seen from above is acutely triangular and edged with a single, slightly irregular row of long, stiff defensive setae which project a little beyond the edge of the epipharynx, both in front and on the

side. In both the male and female on each side near the base of the epipharynx, is a group of about 20-25 taste-cups, each giving rise to a short hair. There are also scattered taste-cups near a point corresponding to the end of the labrum. On the upper side of the free edge of the epipharynx, there are scattered taste-cups, varying in size, and like those already mentioned, though some of them are without perceptible hairs.

At the end of the epipharynx in the female are several gustatory pegs or rods; but in the male examined they seemed to be more numerous, there being a group of two short stout ones in the middle, one on each side of the median line of the body; and a group of four larger ones on each side of the central pair.

On the under side of the epipharynx there is a striking variety of hairs, differing much in character and variously grouped. Around the edge of the anterior division of the organ, there is a single row of very long, rather stout setae, apparently tactile, possibly both tactile and defensive. The edge, however, of the basal division of the epipharynx, is thickly fringed with long slender hair-like setae, flattened and triangular at the base. Three of the setae are larger than the others and spinulose. The greater part of the organ is free from hairs, there being only two groups near the middle of fine slender hairs which are flattened and broad at the base; these, like those fringing the edge of the basal division, in shape resemble the "gathering" hairs of the bee's proboscis, and are evidently for the purpose of collecting and amassing moisture, whether the saliva or the liquids entering the mouth, or both, we cannot say. These delicate gathering hairs, *i. e.*, those which are very slender and flexible and arising from a flattened triangular base, as we have seen in *Vespa maculata* and *Nematus erichsonii*, line the pharynx, above and beneath, though of varying sizes and mode of grouping. Indeed, the epipharynx is simply a continuation and outgrowth of the roof of the mouth. The exact function of these hairs remains to be determined. They seem to be, so to speak, colossal chitinous cilia, serving at times to retain the saliva or liquid food in certain places, and in others to facilitate the passage of the food down the throat.

The labrum-epipharynx of *Boreus californicus* is quite different in shape from that of *Panorpa*; it is a little longer than broad, not dorsally separated by a distinct transverse suture from the clypeus, though laterally separated by a distinct notch. The labrum itself is not longer than broad, and not excavated in front, but on the contrary somewhat produced, extending into the base of the parepipharynx. Near the base at each side is a dark chitinous triangular thickening of the shape of a mandible, but not dentate at the end. Between the base of these mandible-like thickenings is a group of four taste-cups, protected on the inside by three defensive setae. On each side of the median line of the labrum, and extending back under what

appears to be the end of the clypeus are two narrow thickenings of the surface, along which are scattered taste-cups, there being about 20 on each side of the median line.[6] There is also a taste-cup on an area corresponding to the thin, front edge of the labrum, about midway between the most distal taste-cup, and the tip of the mandible-like thickening.

While the epipharynx of *Panorpa* scarcely projects beyond the acute end of the labrum, and is apparently divided into two large lateral divisions, and moreover is divided into a basal and distal portion (a somewhat significant fact in connection with the possibility that the labrum represents a pair of appendages); in *Boreus* the parepipharynx extends well beyond the end of the labrum, and shows no signs of a division into lateral or longitudinal lobes. It is a somewhat crescent-shaped whitish fold, tending in front of the labrum to a distance nearly half its width. There are no taste-cups on it, but around the edge a series of about 16 large taste-rods, which project as far as the marginal hairs situated between them. They are considerably, about twice, as long as those at the extremity of the epipharynx of *Panorpa*.

All of the hairs appear to be of the kind denominated gathering hairs, and we do not appear to have the marked differentiation into different kinds of hairs and setae noticeable in the epipharynx of *Panorpa*. They are in *Boreus* arranged in about six curvilinear series; and are broad at the base, not triangular, but with parallel sides until in the middle they suddenly contract into hairs. They are probably neither specially tactile or protective, but rather adapted for gathering liquids and promoting their flow down the throat.

Taste-cups on the labium and maxillae of Panorpa.—In the same species (*P. debilis?*) I have noticed taste-cups on the labium in two regions; a group of five or six on the upper surface, on each side at the base of the first or basal joints, also a group of about a dozen on each side of a region including the base of the labium and end of the mentum. These taste-cups are characterized by having a short minute hair arising from the centre of the cup. They were observed in the male, but undoubtedly occur in the other sex, as I have not as yet observed any sexual distinctions in this group as regards the distribution either of gustatory or olfactory organs.

In the maxillae of the same species there are in both sexes a few taste-cups, protected by long defensive setae on the stipes near the base of the palpi; and in the male I noticed a group of five such pits at the base of the lacinia, while others are scattered along the outer edge, near the base of the singular series of marginal comb-like sets of flattened,

[6] It should be observed in view of the figures by Dr. W. Patten, Studies on the eyes of arthropods, Journ. morphology, July, 1888, v. 2, pl. 7, p. 1–7, of the labrum of *Acilius*, which appears to answer to a pair of limbs representing a first pair of antennae; that in *Boreus*, besides the bilateral mandible-like thickenings the labrum also appears to be slightly divided along the middle by these two parallel ridges or thickenings, giving rise to the appearance of an obsolete median suture. But this needs further examination.

curved, scraping hairs. A few taste-cups were also noticed scattered in a row along the outer edge of the galea of the female.

Taste-cups on the maxillae of Boreus californicus.—No taste-cups were observed on the labium of *Boreus*, which is very different in shape from that of *Panorpa*, unless four or five pits protected by two or three spines and situated at the base of the palpi are such. On the basal region of the galea of the maxillae, however, there is a series of taste-pits, the basal one the largest. No hair arises from the centre, and the pits are protected in front and on the outside by unusually short and stout peg-like defensive setae.

The structure of both the labium and maxillae of the mecaptera is very interesting, but space forbids our entering into farther details.

Olfactory rods on the palpi of Panorpa and Boreus.—At the end of the second or distal joint of the labial palpi of *Panorpa* is the usual pale area, bearing about 18 small short rods, which are probably olfactory; these are as usual roughly arranged in two series, and by groups. The last joint of the maxillary palpi bears olfactory rods of the size and number of those in the labial palpi. The end of the distal joint of the very short labial palpi of *Boreus*, is provided with about ten small olfactory rods which are slightly larger than those of the maxillary palpi.

The rather acute end of the maxillary palpi terminates in a pale clear space through which can be dimly seen the nerves leading to the seven or eight olfactory rods, which themselves are a little smaller than those of the labial palpi. Also at the distal end of the second joint are four sensory pits.

The olfactory pits of the antennae of Panorpa and Boreus.—In the terminal antennal joint of the female of *Panorpa* there are to be seen on one side about 35 olfactory pits scattered irregularly among the setae. In both sexes of *Boreus*, there are to be seen on one side of the last joint about eight olfactory pits, none at the end; on the penultimate joint there are on one side five pits, three in a row on one side, two on the other; the third and fourth joints from the end have two on the side next to the observer, the fifth and sixth one each.

Of course the exact function of these antennal pits is hypothetical until determined by repeated experiment; but provisionally they may be regarded as olfactory in their nature.

In conclusion we may say that by the use of the creosote and oil of turpentine mixture, the sense-organs can be easily examined superficially, and it is very fascinating work. It should, however, when possible, be supplemented by the preparation and examination of sections, after the most rigorous and exact histological methods, so as to reveal the nerves and ganglion cells of special sense.

The specimens of *Boreus* were kindly given me by Dr. A. Agassiz, Director of the Museum of Comparative Zoology, Cambridge, Mass.

OBSERVATIONS ON SOME VARIATIONS OF THE MALES IN CLINIDIUM.

BY FREDERICK BLANCHARD, LOWELL, MASS.

In the Transactions of the American Ent. Soc. v. p. 162, Dr. LeConte discusses at some length the *Rhysodidæ* of the United States. A recent examination of a small series of *Clinidium* showed, on comparison with the notes and descriptions in the above mentioned paper, quite considerable differences in the ♂ characters. There are before me four males and nine females. Of these, only one, a ♀ without locality, has the thorax oblong as required by the definition of *sculptile* given by LeConte. The others have the thorax distinctly narrower anteriorly as is said of *calcaratum*. One ♂ from D. C. agrees in its sexual characters with the description of *sculptile*; the anterior tibiæ, however, are much more strongly angulate than is indicated by the figure given. For the sake of comparison the following copy is given of the description of the ♂ of *sculptile*; — "Front thighs distinctly toothed; front tibiæ rather suddenly dilated on the inner side, above the oblique groove, then sinuate; middle and hind tibiæ subsinuate on the inner side, produced inwards at tip into a sharp process. Prosternum with a broad stripe of velvety surface; ventral segments with spots of similar pubescence."

In *calcaratum* ♂, the 'Front thighs are not toothed; front tibiæ very feebly dilated on the inner side; middle and hind tibiæ with a large pointed apical process on the inner side, one half the length of the tibiæ; under surface without velvety spots.

A second ♂ from N. C. is like the first mentioned, but differs in having the hind thighs distinctly toothed inside, just before the apex, and in the prosternum being quite smooth at the middle, without any trace of velvety pubescence. The hind tibiæ are more distinctly sinuate.

In two other males also from N. C., the front thighs have a small tooth; the front tibiæ are rather suddenly narrowed at base and not at all angulate; the middle and hind tibiæ with apical inflexed process, on the posterior ones very strong, apparently quite as well developed as is said of *calcaratum*; hind thighs as usual, merely sinuate before the apex; prosternum smooth, abdomen with velvety pubescence on the first four segments.

A majority of the females seen have the last ventral strongly protuberant at middle, and transversely impressed behind. Others are intermediate between these and those having the same segment merely feebly convex. In all, the front thighs are not toothed, the middle and hind tibiæ simple and the prosternum and abdomen without velvety spots at middle.

To exhibit it a glance the differences in the males the following table is added:

Anterior ventral segments pubescent at middle, front thighs toothed.
Front tibiæ angulate.
Hind thighs not toothed, prosternum velvety pubescent at middle. A. *sculptile.*
Hind thighs toothed, prosternum smooth. B.
Front tibiæ sinuate, not at all angulate, prosternum smooth, hind tibiæ with stronger apical process. C.
Ventral surface without velvety pubescence along the middle, front thighs not toothed, front tibiæ not angulate, apical processes of middle and hind tibiæ very long. D. *calcaratum.*

C. sculptile Newm. is not rare in the Atlantic States. *C calcaratum* Lec is from Or. and V.I.

Were the above described secondary ♂ characters in A, B, and C, accompanied by any constant differences in form or sculpture, three very distinct species would seem to be indicated; but there does not appear to be the slightest clew to show which females belong with any of the males, and it is perhaps not impossible that a series of specimens may prove that the ♀ of D, is not easily distinguishable from the eastern forms.

In conclusion it is suggested that those who are located within the faunal limits of *Clinidium* examine their material for the purpose of learning if all the variations mentioned, or any others not yet noted, occur in one locality. In the vicinity of Lowell the family does not appear to be represented.

SOME NEW COMPARISONS OF PIERIS OLERACEA WITH P. NAPI.

BY SAMUEL HUBBARD SCUDDER, CAMBRIDGE, MASS.

As *Pieris oleracea* of North America has been regarded as identical with *P. napi* of Europe by some who have studied only the markings of the wings, I have thought a comparison based on the early stages would be desirable; this I am now able to make by the kindness of Mr. J. Jenner Weir of England, who has kindly sent me a number of specimens of blown larvae and living chrysalids of the latter. Other caterpillars from the continent have been ofservice.

The mature caterpillar of *P. oleracea* differs from that of *P. napi* of Europe in the more uniform pile with which the body is clothed, and by the apparent absence of those comparatively large conical wartlets, ten or twelve times larger than the smaller ones, which form so conspicuous a feature in both *P. napi*

and *P. rapae*, and which are arranged at subequidistant intervals in a transverse row on each of the subsegments of the body; they are present in *P. oleracea*, but are not nearly so large relatively as in *P. napi*, except possibly on the stigmatal subsections of the anterior part of the body, and are further inconspicuous in being either concolorous with the body, or white, or only a little infuscated, while in both the other species mentioned they are piceous and most conspicuous; occasionally, however, when white, they are marked with a fuscous annulus around the base and so are made more conspicuous, but herein they approach the normal type of *P. rapae* and not of *P. napi*.

The chrysalis of *P. oleracea* differs from that of *P. napi* of Europe, first, in the following structural features: the frontal tubercle curves distinctly upward, while that of *P. napi* is directed straight forward; the elevation of the suprastigmatal carina to a distinct, spinous, compressed tubercle on the sides of the anterior part of the third abdominal segment, is far more marked, and the tubercle itself distinctly flares laterally, which that of *P. napi* cannot be said to do. Second, in colorational peculiarities: Chrysalids of *P. napi* are far more heavily marked; especially the suprastigmatal carina is margined interiorly with large blackish fuscous patches forming a more or less interrupted band over the second to the eighth abdominal segments; the fourth of the tenth segments have a distinct mediodorsal black dash at the anterior margin: and the disk of the wing cases is marked with a double black dash besides the black specks; none of these markings are present in *P. oleracea* except the first named, on the second and third segments, and occasionally a fuscous indication posterior to that; the black specks or dots are found on the wing cases, but the black dashes are wanting. The further dorsal markings of the abdomen of *P. napi* consist, on most of the segments, of a curving or diverging series of black dots, three on a side next the middle line above, open posteriorly, and an oblique arrangement of two black dots on either side, nearer the suprastigmatal than the mediodorsal carina, the anterior marginal or submarginal and the outer, the other anterocentral and the inner; none of these except the submarginal dot of the outer series is found at all in *P. oleracea*, and then only, as a general rule, on the third to the sixth segments and accompanied on the fifth and sixth by a companion dot, sometimes double, a little way above the spiracle.

The male imago of *P. oleracea* differs structurally from that of *P. napi* in the hook of the upper organ of the abdominal appendages, which is shorter and more strongly curved at tip, while the semicorneous expansion of the under edges of the base is not a downward directed, vertical lamina, thickening into a posterior, downward directed thorn, but a short curved hook, opposed to the hook of the upper organ.

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LAC INSECTS.

Mr. B. P. Mann sent me 24 July 1885. two specimens with lac insects from Lavedo, Sonora, collected by Dr. E. Palmer, about 60 miles from Fort Yuma on the Colorado River. One is *Carteria mexicana*, Comstock, Report U. S. Dept. agric. 1881 p. 212; Cornell univ. Exper. stat. 1883, 2d rept. p. 130 no. 125. from the twigs of *Larrea mexicana*. The other from *Pluchea borealis* has much larger lac lumps and seems to be new. Both insects puncture the older stems and the lac is secreted upon them. This gum occurs in great abundance and is used by the Indians to mend their baskets and pots and to fasten the handles into them. Moreover the Indians in their games and walks have foot-balls which they make by coating stones with this lac and kick along before them.

H. A. Hagen.

MIGRATION OF *AGANISTHOS ACHERONTA*.

Mr. S: H. Scudder having asked me for the details of an observation to which reference is made in the *American naturalist*, April, 1877, v. 11, p. 245, I have turned to my notes made in Brazil, in 1871, and found the following entry:—

"Fr. Feb. 17. . . . Great numbers of No. 1503 followed each other singly at intervals across the meadow in front of the house, migrating apparently, and were very difficult to catch."

Mr. H. K. Morrison states that my No. 1503 is *Aganisthos acheronta* Fabr. I believe the determination was made for Mr. Morrison by Mr. Herman Strecker.

I remember the occasion of the observation. The butterflies came with powerful rapid, direct flight, perhaps from three to five meters above the level of the meadow, from the direction of a rising ground or small hill near by. After seeing several and noticing the uniformity of their behavior, I ascended the hill, and thus, so far as I recollect, came within reach of them. From how great a distance they came I could not tell, nor can I now say from or to what direction of the compass they flew. The season, as will be noticed, was early fall

B: Pickman Mann.

DURATION OF LIFE IN AN EPHEMERA.

What is probably *Ephemera* (*Leptophlebia*) *cupida*, is common at Providence, R. I., on the banks of the Seekonk about the middle of May. Of four specimens carefully taken, some of them at different times, with a net and allowed to fly into a bottle, and then transferred to a tumbler, one lived about twelve hours, and another 24 and a third 48 hours. A fourth individual was captured Saturday P. M., at five o'clock. It was in the subimago stage, being of a dull slate-gray with none of the reddish hues of the imago. It lived about a day before moulting, when the colors appeared, *i. e.*, flesh tints at the base and on the costa of the fore wings, as well as on the pterostigma. It had moulted Monday and lived a full week after, being observed alive the following Monday morning, but was found dead in the tumbler Monday morning, May. 14. 1888. It had thus lived over eight days, without taking food. Had

it mated soon after casting its subimago pellicle it is probable that it would not have lived but a day or two longer. *A. S. Packard.*

PAIRING OF XYSTICUS TRIGUTTATUS.

The engraving shows the pairing of one of our most common crab spiders, *Xysticus triguttatus* Keyserling. The spiders were seen on the 5th of June, among the short

grass in an open pasture between Salem and Swampscott, Mass. The female held herself, head downward, on a blade of grass with the abdomen turned away only enough for the male to reach under it with his palpi. There did not appear to be any web on the grass, though there may have been a few threads for the female to hold by. *J. H. Emerton.*

TROX AT ELECTRIC LIGHT.

The fondness of various species of *Trox* for electric light has increased considerably the list of species known to inhabit Illinois. The following list includes all known to me.

1. *Trox scabrosus* Beauv. Taken at electric light at Springfield 20 June 1885, by Mr. C. A. Hart.

2. *Trox monachus* Hbst. There is a specimen of this species in the collection of the State entomologist from Union Co. It has also been taken near Pittsfield Ill.

3. *Trox asper* Lec. One specimen obtained at electric light at Springfield.

4. *Trox punctatus* Germ. Not uncommon throughout the state.

5. *Trox tuberculatus* Deg. Specimens in the State entomologist's collection taken at Centralia 22 April.

6. *Trox erinaceus* Lec. Rather rare but found throughout the state.

7. *Trox capillaris* Say. Specimens in the State entomologist's collection from La Salle Co.

8. *Trox unistriatus* Beauv. Quite common throughout the State.

9. *Trox foveicollis* Har. Rather rare.

10. *Trox terrestris* Say. I have seen specimens from Pittsfield.

11. *Trox aequalis* Say. Rare in northern and central Illinois.

12. *Trox scaber* Linn. Taken at Galesburg.

13. *Trox atrox* Lec. Recorded by Horn from Illinois.

Only eight other species are known in the United States.

C. W. Woodworth.

LUMINOUS EGGS OF INSECTS.—E. Mulsant observed and recorded in 1862 the fact that the eggs of *Lampyris* were luminous. This observation was confirmed by Dr. A. Laboulbène, who published the statement in 1882, but some entomologists have doubted the fact of their luminosity. Wielowiejsky, who published a paper in 1882, that dealt thor-

oughly with the luminosity of *lampyridae*, says the eggs can be luminous only on account of some external substance which they derived from their mother, or on account of light-giving power of the young larvae within them. Again, Laboulbène and H. Lucas have published (Bull. entom. Soc. entom. de France, 12 Sept. 1888, p. 133-134) the fact that the eggs of *Lampyris noctiluca*, as well as its larva, are luminous, and Laboulbène states that the luminosity lasted about a week.

G: Dimmock.

PHOSPHORESCENCE OF MYRIOPODS.—M. J. Gazagnaire has lately studied the phosphorescence of *Orya barbarica*, an Algerian species of *geophilidae*, and finds that it is caused by a viscid secretion from the pores on the ventral side of the whole length of the body. This is contrary to the view of Dr. R. Dubois, who supposed the phosphorescence to have its origin in the epithelial cells of the digestive tract. M. Gazagnaire has further found that the phosphorescence does not occur at all times, but that its appearance is during the time that the genital organs of the *geophilidae* are in a state of activity.

G: Dimmock.

THE MECONIUM OF BUTTERFLIES: — M. Théodore Goossens communicated a notice to the Société entomologique de France, 11 April 1888, on the above subject. We translate the notice in full from the *Bulletin entomologique* of that Society.

"If the rearing of larvae affords gratification in studying, as far as possible, their habits, it sometimes gives one bitter disappointments. Sometimes all the caterpillars, almost full-grown, die at once without a trace of diarrhoea or of fungi, that is to say of other causes than flâcherie or muscardine. After having sought in vain the cause of the trouble, one forgets it until a similar accident happens."

"Chance taught me one of the unknown causes of this mortality. For several years I have reared different caterpillars in colored boxes for the purpose of determining the influences of refrangibility upon lepidoptera. The blue being, among the simple colors, the one that favored best their development, I had placed some pupae of *Vanessa prorsa* in a blue box. There were already in this box some half grown caterpillars of *Fidonia atomaria*, but they were in a tube and the tube had a cork stopper. A *Vanessa prorsa* emerged, expanded itself, and, ready to take to flight, discharged the meconium which it had accumulated during the pupal state. This meconium fell upon the stopper of the tube and immediately the twenty caterpillars were dead. It was difficult to ascribe such a power to the meconium. A second *Vanessa* again furnishing this liquid, I took some of it on a brush, and put it in another box where there were some caterpillars of no value to me. In a short time they likewise died: but other caterpillars touched with dry meconium lived as usual.

"It seems then, that it is the vapor of this substance, composed mostly of uric acid, that has the property of killing caterpillars, and that when we rear caterpillars in the same vessel in which chrysalids are already formed, we subject ourselves to the same accident without suspecting the true cause."

G: Dimmock.

HOUSEHOLD PESTS.—The editor of *Good housekeeping* received a considerable number of letters in competition for the prizes mentioned on p. 59, of this volume of *Psyche*, and the decision as to the merits of the various remedies proposed was left to Dr. C: V. Riley. The numero of *Good housekeeping* for 27 Oct. 1888, gives Dr. Riley's letter in reference to the remedies proposed, and quotes not only the letters of the prize-winners, but all those mentioned by Dr. Riley as meritorious. This collection of letters is an excellent symposium on remedies for household insects. *G: Dimmock.*

MYRMECOPHILISM.

BY WILLIAM TRELEASE, ST. LOUIS, MO.

[Address of the retiring president of the Cambridge Entomological Club, 11 January 1889.]

It is customary in some circles for a president's address to consist of a general résumé in some line of scientific work. I have availed myself of this opportunity to review the more important literature on a branch of biological work which has long possessed an unusual degree of interest for me,—namely, the mutual relations, amounting in some cases to symbiosis, existing between ants and certain members of the vegetable kingdom. Such a forced review is profitable to the writer, and it may be of interest to the body before which it is read; but it by no means follows that it has scientific value, for each worker must perforce go back to original sources for information needed in his own researches. Quite naturally, I have treated the subject from a botanical standpoint, since, with the exception of certain acquired habits, the specializations are chiefly such as fit plants to profit by the visits of ants to their vegetative or fruiting organs.

1. The functions of extra-nuptial nectar-glands.

The chief sorts of glands situated on the surface of plants or opening superficially, are divided into colleters and nectar-glands, according as they secrete resinous, mucilaginous, or gummy substances in the one case, or sugary fluids in the other. The first are apparently for the most part protective, in that they form a coating over young parts in the bud, which prevents drying or other injury; or they prevent the access of unbidden guests to the flowers or fruit, or deter vegetable feeders from making an onslaught on the parts which bear them, —in this respect resembling raphides, alkaloids, volatile oils, etc., within the plant.* A few such structures serve for the attachment of fruit or seed to animals for purposes of dissemination, etc. The digestive glands of carnivorous plants may, perhaps, be regarded as derived from some of the numerous types of colleters, and the foliar nectar-glands of many plants are pretty clearly homologous with the serration- and other colleters of the same and related species. Typical colleters are, therefore, chiefly protective, and there is good reason for believing that many of them have been evolved for preventing the access of ants to the flowers of plants, where, almost without exception, the presence of these insects works mischief.

Nectar-glands, on the other hand, are of indirect use by attracting suitable pol-

* For a recent discussion of the protection of plants, especially from the attacks of snails, by colleters and other deterrent structures, see an elaborate paper by Stahl in Jenaische Zeitschrift für naturwiss. und medicin, xxii.—reprinted under the title "Pflanzen und schnecken," Jena, 1888.—Abst. in Bot. centralblatt, 1888, v. 36, p. 164-170.

linators to the flowers, by luring prey to the digestive apparatus of some carnivorous plants, or by maintaining upon the plant a body-guard of pugnacious insects, which more or less efficiently protect it against certain of its enemies.

Since the time of Sprengel (29), it has been well known that many flowers contain glands which secrete nectar as a source of attraction to insects able to cross-pollinate them. The occurrence of this fluid was known long before his day, but its use was either not investigated, or misunderstood. Indeed his keen insight into its *raison d'être* was scarcely appreciated for three-quarters of a century, until Mr. Darwin took the subject in hand in his classical work on the pollination of orchids. To-day, however, Sprengel's views, cleared and somewhat broadened, and carried into a thousand little details that he had not followed out, are contested by very few persons. So far as our purpose is concerned, nothing further need be said of floral nectar, since the structure and habits of ants are such as to practically debar them from any important rôle in pollination. In fact entomophilous plants usually teem with devices for preventing their access to floral nectar,—for which, very naturally, they have a great liking.

The relation of extra-floral nectar to the fructification of plants was, I believe, first clearly pointed out by Delpino, (6, 86), who coined the terms "nuptial" and "extra-nuptial" to indicate on the one hand that which attracts pollinators, and on the other, that which is of no value in this respect. These terms are much less objectionable than "asexual" and "sexual," the former of which has recently been used by Kny (13) as synonymous with extra-nuptial. With nuptial nectar secreted outside the flower, we have quite as little to do as with that secreted within it, for the reasons already indicated; but the subject of extra-nuptial nectar and its relation to ants, is deserving of a much fuller discussion than can be given to it here without going into details to a tiresome length.

Without an undue amount of searching, I cannot say when or by whom it was first observed that certain flowers produce nectar outside of their flowers, but it has certainly been known for a long time. Hall, a pupil of Linnaeus, had seen the extra-floral glands of various plants (11, 266). Krünitz (14), whose work I know only from references in Sprengel and elsewhere, observed bees at the stipular nectaries of *Vicia*, over a century ago, and similar observations had undoubtedly been made, if not heeded, even earlier. But the first careful investigations into organs of this sort, and their secretions and uses, were made simultaneously but independently by Delpino (6 and 7) in Italy, and Belt (2), in tropical America. While other observers have contributed many isolated facts to the knowledge of these organs in the fifteen years since the observations and conclusions of these naturalists were published, the task of following up and systematizing the distribution of protective nectar has de-

volved upon Delpino (8), whose evidently thorough studies are now in course of publication, the results already printed occupying over 150 quarto pages.

Broadly speaking, this class of extra-floral nectar-glands, by their secretion, attracts to the plants which bear them hordes of ants (rarely wasps), which constitute a temporary and changing body guard, disputing the presence of all other insects with the exception of their protégés the sugar-excreting aphides, coccids, etc., and resisting, often furiously and effectively, the onslaughts of ruminants and other large animals. That this is a true explanation of the reason for the existence of these structures, is generally admitted, today.*

The plants which possess such glands are phaenogams and ferns, chiefly of the tropics and subtropics; yet the number in our own and other temperate floras is rather surprisingly large.

The ants attracted by extra-nuptial nectar are mainly the omnipresent, omnivorous species. Protection is often afforded against various caterpillars and other leaf-eating larvae, as Ratzeburg (24) and others have observed; but the body-guard appears primarily destined to resist the depredations of other members of their own group,—the leaf-cutting ants,—which swarm in tropical and subtropical regions, and quickly defoliate plants not provided with this defence unless efficient service is rendered by colleters or alkaloids, which prevent the access of these insects to immature and tender parts, or render these distasteful to them. Delpino was at first inclined to explain the occurrence of protective nectar in regions where no leaf-cutting ants are found, solely with reference to herbivorous larvae. But it has been shown several times that such larvae are permitted in large numbers on plants provided with a body-guard of ants attracted by nectar. I have myself observed this in the case of *Gossypium*, which suffers notoriously from the attacks of *Aletia* and *Heliothis*, although it is unusually well supplied with extra-nuptial nectar that attracts numerous ants which to a certain but insufficient extent do attack the caterpillars of the moths named. The same thing is also to be seen on *Populus monilifera* in the west and south, where this tree is subject to very disastrous attacks from the larvae of a chrysomelid beetle, *Plagiodera scripta*, and a moth, *Acronycta populi*. Careful observations of the behavior of insects attracted by extra-nuptial glands, carried through a number of seasons, and on plants with differing surroundings, accompanied by correct identification of the insects are possible to local entomologists everywhere, and are much to be desired.

There seems little reason to doubt

* For a general negation of the prevalent notions concerning nectaries of all sorts, coupled with a good histological study of many of these organs, reference should be made to Bonnier's essay—Les Nectaires—in Annales des sci. nat., Bot., 1879, v. 8. also published separately at Paris,—which reverts to the theories of the last century.

It is also to be observed that Kerner von Marilaun, the learned Viennese biologist, quite recently describes the petiolar glands of *Populus* as organs of absorption Pflanzenleben, v.1. 215),— but without giving reasons for his belief nor an indication that another function had been previously ascribed to them.

that these protective adaptations are the result of natural selection, acting through the ages of co-existence of plants and their enemies. I have long felt a conviction that the occurrence of extra-nuptial nectar-glands on so many of our own plants which are not menaced by leaf-cutting ants (except in the extreme southwest), must date back to later geological periods, characterized by a warmer climate in northern latitudes, and by a much greater prevalence of ants of many kinds than is the case with us now*; and that a corresponding prevalence of leaf-cutting or other noxious ants is demonstrable in these periods. Unfortunately, I have never been able to pursue the subject in this direction, but the immense collection of fossil ants in the possession of Mr. Scudder must furnish instructive data for testing this opinion, when its treasures shall have been sufficiently studied to show the affinities of the prevalent genera of those times in northern America. That structures corresponding in position to the foliar glands of existent species of *Populus* were found on tertiary plants, is shown by their occurrence on *P. glandulifera*, Heer (31, p. 290), but I do not now remember that they have been recognized elsewhere.

While, as has been shown, the secretion of food for protective ants is often rendered superfluous by the provision of other more direct deterrents, the two classes of protective adaptation sometimes occur conjointly. Lundström (16, p. 83) has shown that the leaves of *Populus* which do not possess nectar-glands are distinguished also by the thinness and flexibility of their compressed petioles, by which caterpillars, etc. are to some extent rendered uncertain in their footholds on these easily shaken leaves. Delpino and Schimper have also observed the protection secured to *Ricinus* by its smooth and very glaucous stems, though its leaves likewise bear extra-nuptial glands.

An aberrant function of the nectar-glands on the leaves of some pitcher plants is that of luring to their destruction, insects which are captured and digested or at least macerated by these carnivorous plants. From the large number of ants found in our *Sarracenia* leaves in a state of nature, this would seem to be true of species of this group; for these ubiquitous insects are certainly led to the orifices of the pitchers by the sugary secretion on the exterior. In his latest paper (8, 227), Delpino holds this secretion to be protective, as in the cases already passed in review; but the opinion which I have here and elsewhere (30, 328) expressed, is that of Riley (25, p. 25), Mellichamp (18, 119), Gray (10, 112), and others, some of them early writers on *Sarraceniaceae*. That ants are largely victimized by these plants does not, of course, signify that the structure of the latter is not such as to facilitate the capture of larger, flying insects, which are, in fact, often found entrapped, especially by the southern Sarracenias and the Californian *Darlingtonia*.

* On this point see a very instructive note by Mr. Belt in Nature, 1877, v. 16, 122.

Leave cannot be taken of the extranuptial nectar of phaenogams and ferns without reference to the sugary exudation which escapes on the emission of spermatia of *Uredineae*. As was shown by Ráthay (23), this is greedily devoured by ants and other honey-loving insects. But the service that these render, if any is rendered, is not clear, since it is not certain whether the spermatia are spores or male reproductive cells, though there is reason for considering them to be spores.* That ants play a considerable part in scattering these bodies is a necessary *a priori* conclusion; but it is not so evident how far the secretion of a sugary fluid is to be regarded as an adaptation to this end. It has recently been explained by Ludwig (15) in accordance with the Delpino-Belt theory.

2. Occasional Ant-domiciles on Plants.

Some part of a plant is not infrequently tenanted by ants which find there shelter or food to their liking, but so far as our own and other temperate floras are concerned, there appears to be no adaptation by which the plant is fitted to maintain or especially profit by this residence of ants. The heart-wood of some of our forest trees is often inhabited in this manner by the large black ant, *Formica pennsylvanica*. On several occasions I have also found an undetermined small brown ant nesting in the old hypanthia of *Calycanthus*, still adhering to the plant, in the botanic garden at St. Louis. No doubt any close observer of the ways of ants can add many instances of the same general character, in which, so far as the biology of the plant is concerned, the ants are merely accidental residents, though their pugnacity may lead them to resist the attacks of other creatures whose presence is distasteful to them.

It is also known that ants sometimes construct somewhat elaborate nests on plants. Some cases of this sort are noted by Westwood (34, 222) and Packard (21, 317), and I presume that a person more familiar than myself with entomological literature could cite other references on this subject. Several years ago I contributed to the Club the gist of observations on a colony of *Crematogaster* which had erected a nest over their wards, certain aphides, on a branch of *Andromeda*, where they apparently spent their entire time (Psyche, v. 3, 31). Similar nests had been observed before by others (Psyche, v. 3, 343; and the Minutes of the meetings held during 1883, 2). In the case observed by myself the ants appeared to be kept at their post by the aphides (which they may themselves have placed upon the plant), and the shelter was evidently constructed as much for these insects as for themselves. Where ants protect the enemies of a plant in this manner, they are clearly injurious to it in the first place, though they may at the same time keep off others of its enemies in endeavoring to guard their protégés. The good may even more than counterbalance the harm done, and Lundström has suggested that in

* See Plowright, managr. of British Uredineae and Ustilagineae, 1889, 11 *et seq*.

some cases aphides may be held as serving their host-plants in the capacity of wandering nectaries (16, 84). It is certain that they are sometimes a stronger source of attraction to ants than either nuptial or extra-nuptial glands.

3. Myrmecophilous Plants, proper.

Some of the earlier travellers, in describing their collections, make mention of the fact that cavities in the stems and stipules, or pockets on the leaves, of some tropical plants are tenanted by ants. This was recorded for *Cecropia* as early as 1648 by Marcgravius (17), and for *Acacia* in 1651, by Hernandez (12). Though scattering observations of more or less biological interest occur in the literature of the succeeding 225 years, it was not until the early part of the last decade that these plants received careful study. In 1872 Professor Caruel published a short paper (3) on species of *Hydnophytum* and *Myrmecodia*, two rubiaceous genera that had been known to harbor ants at least since the studies of Rumpf in 1750. The field notes and material for this paper were obtained from Beccari, who was led to believe that shortly after germination the bases of these plants are pierced by ants (subsequently identified as species of *Crematogaster* and *Iridomyrmex*) which tunnel the gall-like enlargement in various directions, making a permanent residence there. The plants were even thought to die while quite small if not pierced, though these attacks might have appeared necessarily injurious, to another observer. Later observations by Forbes (9) and especially by Treub (33) who has made good use of the unusual facilities afforded by the botanical garden at Buitenzorg in Java for cultivating tropical plants, seem to show that this puncturing of the stem is not so essential to the life of the plant as was supposed by Beccari; for in a series of cultures it was found that not only do young plants and seedlings develop when removed from all possibility of ant visits, but the excavations and perforations in their stems appear spontaneously. According to Treub, these elaborate structures, which in a state of nature appear to constantly serve as domiciles for ants, represent in reality a highly developed water-tissue, by which the plant is adapted to its epiphytic habit. The view that they are not primarily connected with the maintainance of a body-guard of ants, is accepted by Schumann (28, 419) in the last extensive study of myrmecophilous plants that I have seen, so that what have for years passed for ant-plants *par excellence*, seem likely to lose even a subordinate position in the growing category of plants of this class. Yet, as it seems to me, granting the full accuracy of Treub's observations, it by no means follows that the curious structure of *Myrmecodia* and related rubiaceous plants is not to be looked upon as an adaptation for providing a body-guard of ants with lodging; and it has been abundantly proved that they are ready to fight whenever they are disturbed in these residences.

At about the time when Beccari was making his first observations on these Malayan plants, Belt (2) was engaged in a similar study of the bull's-horn *Acacia* in tropical America, and here, as in the case of extra-nuptial nectar, the credit of having first recognized the protective signification of the structure, is shared by Belt and Delpino (6, 91). As a result of his studies and those of Francis Darwin (5) and Schimper (27), it seems to be definitely settled that in the spongy enlarged stipular thorns of several species of *Acacia*, certain ants find shelter, and are kept upon the plant by a sugary secretion similar to that which attracts wandering ants to so many other species of this and other genera, while in highly nutritious bodies at the tips of the leaflets is to be seen a further food-supply,—the three provisions securing their permanent residence.

Cecropia peltata and some other species of the genus are also known, thanks to Fritz Mueller (19), Francis Darwin (5), Schimper (27), and others, to produce upon their petioles food-bodies that are likewise eagerly gathered and eaten by ants, which inhabit the hollow stems of these species. Quite recently Schimper (27) has shown that in *C. adenopus* an unmistakable provision facilitating the entrance of the ants, exists in a thin soft spot observable on each internode of the hollow stem,—a fact which was indicated in 1876 for the Imbauba, by Fritz Mueller (4).

The number of species that may be classed as truly myrmecophilous, in that they afford lodging, sometimes accompanied by a provision of nectar or solid food, or both, calculated to maintain upon them a permanent army of ants, is already large. All are, so far as I know, phaenogams, but they are distributed through widely separated orders in this group. To Beccari, more than to any other single naturalist, is due the credit of having systematically undertaken their study in the field; and few biologists have published their observations so sumptuously as his appear in the volumes of his "Malesia." Unlike the plants with simple extranuptial nectar, these symbiotic plants often show a restriction in the species of ants which frequent them. And it is interesting to observe that closely related species sometimes inhabit myrmecophilous plants of widely separated regions.* Time will not permit me to enter into a more detailed discussion of the many cases of proved or probable symbiotic myrmecophilism, but enough has been said to show that on the one hand myrmecophilous plants join closely to those which provide food for a body-guard of ants which they do not furnish with a residence; while on the other hand they offer equally good transitions to those more or less constantly inhabited by ants which must seek their food from other sources than special secretions or derivatives of the plant. While both of these classes are represented in temperate climates, it is suggestive that the most highly specialized cases of myrmecophilism are not known to occur out-

* Cf. Schumann, *l. c.*, p. 416.

side the tropics, where, as the observations of Belt, Fritz Mueller, and others show, plants that do not possess some special and effective means of repulsion or defence are quickly stripped of their foliage, and where, from a persistance of this danger since the cooling of higher latitudes, natural selection has been kept in operation after it ceased to work great changes in this respect elsewhere. As might be expected, myrmecophilism in the more restricted sense may be replaced by other protective devices; and Schimper (27) has in fact shown that a tropical American species of *Cecropia* is enabled to dispense with the body-guard needed by its relatives, through having very glaucous stems, over which leaf-cutting ants cannot climb to its foliage.

In 1887, a rather remarkable paper (16) was published by Lundström, of Sweden, in which the hairy nerve-axils on the lower leaf-surface of oaks and other woody plants, the pits similarly situated on the coffee plant, etc., and a variety of other structures, were described under the name of domatia (diminutive of δῶμα, a house). The greater number of these are held for mite-domiciles (acaro-domatia), but it appears as if a fairly good series might be made from the simpler acaro-domatia to some of the more specialized pockets of leaves (myrmeco-domatia) inhabited by ants, that have especially been described by Schumann (28). If this is true, a plausible explanation of the one, when reached, may throw light upon the origin of the other. It may, therefore, be worth while to note that Lundström holds acaro-domatia for slightly specialized mostly hereditary structures that serve as a shelter for various mites, which benefit the plant by clearing its leaves of fungus spores which may fall upon them, and by contributing to their nutrition carbonic acid from their own respiration, as well as their excrement, exuviae, and, ultimately, their dead bodies. While this explanation appears far-fetched to most biologists, it is not unlike that applied by Beccari to the myrmecophilism of *Myrmecodia*, the ant-inhabitants of which are thought to contribute to its nutrition in a similar manner. Whatever the value of his hypothesis may be, it must be conceded that the Swedish botanist has brought together about them a large series of little known and unexplained structures, which can scarcely be looked upon as insignificant by the present school of utilitarian biologists.

In closing, attention should be called to the relations of ants to the seeds of plants. It is well known that in warm countries some ants carefully and systematically harvest the fruit of species which are to their taste, and it would appear that they also take some agricultural interest in the welfare of these plants. While this indicates a high grade of care for the food-producing species, the benefit to the plant is that which a cultivated crop receives from the self-interest of man in its preservation and propagation, without in any way approaching symbiosis.

The resemblance of some seeds or fruits to different kinds of insects or other arthropods has several times been commented on. Perhaps it is still an open question whether or not this is mimicry, but it has been so regarded by a number of naturalists, being held in some cases to secure dissemination by insectivorous birds, etc., and in others to render the detection of the seed by graminivorous birds, difficult. Suggestions are not wanting that in some of these resemblances, and some other seminal peculiarities, adaptations exist for securing dissemination through the agency of ants. Mr. Charles Robertson tells me that the arils of *Sanguinaria* seeds possess an attraction for ants, which drag the seeds off for considerable distances. I cannot say whether they finally eat these fleshy appendages. According to Lundström (16, 79), *Melampyrum* seeds resemble ant pupae in size and form, and, as he believes, in odor also, to such an extent that ants are deceived into caring for them as if they were their own pupae, until the mistake is discovered. Mimicry, such as he suggests, is a very difficult thing to prove to the satisfaction of unbiased biologists, but observations cited by him would seem to show that unusual attention is really paid to these seeds by ants which do not subsequently make use of them for food. The bracts of some species of this genus bear extranuptial nectar-glands, which Ráthay (22), who studied them carefully, could not explain by the protective theories of Delpino and Belt, or Kerner, though they are visited by ants. As the latter are thus attracted close to the fruit, Lundström suggests that the office of these nectar-glands may stand in close relation with the supposed mimicry observed in the seeds, — but this entire subject, while full of suggestion, is still in need of careful and comparative study.

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CONTENTS:

ADVERTISEMENTS 182
NOTES ON CERTAIN CYNIPIDAE WITH DESCRIPTIONS OF NEW SPECIES.—*C. P. Gillette* 183-188
NOTES ON THE PARASITE OF THE SPOTTED LADY BEETLE (MEGILLA MAMLATA).—*Clarence Moores Weed and Charles A. Hart* 188-190
COSMOPOLITAN BUTTERLIES.—*Samuel Hubbard Scudder* 192
NOTES ON THE EPIPHARYNX, AND THE EPIPHARYNGEAL ORGANS OF TASTE IN MANDIBULATE INSECTS.—*Alpheus Spring Packard.* 193-199
ENTOMOLOGICAL NOTES 200

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NOTES ON CERTAIN CYNIPIDAE WITH DESCRIPTIONS OF NEW SPECIES.

BY C. P. GILLETTE, AMES, IOWA.

[Reprint, with additions, of "A study of the cynipidae" (Rept. Mich. board agric., 1888, p. 446- . Separate, 15 p.)]

I wish to acknowledge my especial obligations to Mr. H. F. Bassett and to Mr. W. H. Ashmead for the determining of many species and for the large number of typical and other specimens that they kindly sent me and which have been a great help in preparing this paper. I am also under many obligations to Dr. C. V. Riley and Mr. L. O. Howard for the determination of galls and parasites; and to Professor A. J. Cook for the opportunities and material put at my disposal in the early part of my study.

OBSERVATIONS ON DESCRIBED SPECIES.

Diastrophus radicum Bass. My galls belonging to this species were received from a fruit-grower near Lansing, Michigan, in May, 1887, and a fine lot of cynips were reared from them. The galls were taken from small roots of the raspberry and appeared as irregular knotty swellings from one-half to three-fourths of an inch in diameter. These galls, which grew beneath the surface of the ground, seem to have been better protected from the attacks of parasites and guest-flies, as only true cynips were reared.

I have never heard of the galls occurring in sufficient numbers to do serious damage. In the College garden several hundred raspberry bushes were transplanted and their roots examined for the galls but none were found.

Amphibolips coccinea O. S. So far as I can find, this species has always been reported as producing galls on *Quercus coccinea*. The only tree on which I have taken the galls is a small scrub oak, which, I was informed by a botanist, was probably *Q. nigrum*, but, as there was no fruit on the tree, the species could not be ascertained with certainty. On this tree there were not less than thirty or forty galls, the largest of which measured one and three-fourths inches in their greatest diameter by one and one-half inches in their least diameter. These galls differ from the

galls of *A. spongifica*, for which they are often mistaken, by occurring on *Q. coccinea* and *Q. nigrum* (?) instead of *Q. rubra*, by having a thinner outer shell, by having the surface more glossy and covered with small pimples, and by having the inner radiating substance matted about the central cell, from which it can easily be removed with the fingers, instead of having these fibers grown into a hard woody center surrounding the larval cell. The fly leaves the gall about the middle of June and its general color is a reddish brown. *A. spongifica* has two dates for appearing, a portion of the flies emerging in June and the remainder in October, and the general color of this species is black.

My specimens of *A. coccinea* began appearing June 16th. Neither guest nor parasites were reared.

Amphibolips spongifica O. S. (*Cynips confluens* Harris, and *C. aciculata* O. S.) Walsh speaks of this species in the *American entomologist* as occurring plentifully on the black oak, *Q. nigrum*, but, although I have seen great numbers of these galls in both Michigan and Iowa on the leaves of *Q. rubra*, I have yet to find one on the leaves of *Q. nigrum*. The only flies that I have reared from these galls are those of the late part of the brood which began to appear October 3. On the 13th of October forty-seven galls were opened which gave seven true gall-flies, twenty-seven parasitised galls and the remainder blanks.

Amphibolips sculpta Bass. The beautiful translucent galls produced by this species I have taken on the leaves of *Q. rubra* and *Q. coccinea*. They are attached to the under side of the leaves and may well be likened to large Delaware grapes in appearance. Galls taken in Michigan began giving flies June 21. Eight of these galls taken July 5 in the vicinity of Ames, Iowa, gave only parasites, two beautiful species of *Torymus*. No guests were reared.

Amphibolips inanis O. S. The gall of this fly is very common on the leaves of *Quercus rubra*. Large specimens are an inch in diameter. The galls are composed of a thin outer shell connected with the central larval cell by many thread-like radiating fibers. The flies begin to appear about the 20th of June. Over 90 per cent of the galls that I have collected have contained parasites. In the majority of cases, the central cell has been found to be crowded full of the parasitic larvae of what I take to be a species of *Tetrastichus*. There is also a large species of *Torymus* that I have found common in these galls.

Amphibolips prunus Walsh. A single specimen of what seems to be the gall of this species was taken from the cup of a black oak (*Q. nigrum*) about the middle of August. The gall was immature and no insect was reared from it.

Andricus clavula Bass. The red swollen tips of the twigs of *Quercus alba*, which are the galls of the above named gall-fly, are very common in Michigan and Iowa. From these galls I have reared several specimens of the guest, *Ceroptres petiolicola*, but no true gall-flies.

Andricus cornigera O. S. When Baron Osten Sacken described the gall of this fly he had never seen the cynip that produced it. His specimens were taken on the pin oak, *Q. palustris*. The galls in my collection supposed to belong to this species were all taken on the red oak and may prove to be a new species. I have taken a considerable number of these galls and they all differ from a beautiful type which I have from the pin oak by being very much darker in color and more irregular and rough in outline. The galls appear like knotty swellings completely surrounding the small limbs. From all sides of the gall little seed-like bodies, much the shape and size of a small barley corn, are pushed out. These contain the larvae of the gall-fly and fall to the ground some time in July, leaving the gall full of holes. I have a single imperfect fly taken from an immature gall.

Andricus futilis O. S. I have searched in vain for this gall in the vicinity of Lansing, but late in the fall of 1887 I found a small *Q. alba* in Ionia county, Michigan, standing in an open field, that had galls of this species on nearly every one of its dried leaves. The flies had made their escape so that no insects were reared.

Andricus punctatus Bass. Galls rare, but are occasionally found on small limbs of *Q. rubra*. They vary from one half of an inch to two inches in diameter and are smooth knotty swellings surrounding the limbs much the same as the galls of *A. cornigera*. From these galls I have reared the guests, *Ceroptres petiolicola*, *Synergus lignicola* and an undetermined species; also the parasite *Decatoma varians*, but no true gall-flies.

Andricus seminator Harr. The brown, woolly galls, so common on the twigs of *Q. alba* in midsummer, are the product of this cynip. Galls gathered early in July gave flies the seventh of the same month. A green parasitic fly, a species of *Syntomaspis*, I have reared from these galls in fully as large numbers as the true gall-maker. No guests have been reared.

Andricus scitulus Bass. This species seems rare. I have taken a few of the galls on *Q. rubra* in the vicinity of Lansing, Mich., and near Ames, Iowa. In the latter case the galls were taken July 5, when the flies were found to be already escaping. A few specimens of two undetermined parasites were also reared. The galls are composed of a woody enlargement of the tips of the twigs.

Andricus flocci Walsh. (*Cynips lana* Fitch.) Walsh marks this species "rare." I took a number of the galls from the leaves of *Q. alba* and *Q. macrocarpa* in Michigan and find it to be one of the most common galls on both these oaks at Ames, Iowa. The galls appear as little bunches of brown wool growing out from the mid-rib, or one of the main-veins, on the under side of the leaves. Beneath the wool is a cluster of small seed-like bodies about as large as a very small kernel of wheat. Galls taken in Michigan late in the fall gave flies March 20. A few parasites, but no

guests were reared. The flies appeared in abundance.

Andricus singularis Bass. Galls very common on *Q. rubra* leaves. In shape and structure these galls resemble the gall of *A. inanis*, but are much smaller, large specimens seldom attaining one-half inch in diameter. The galls project on both sides of the leaves, the larger portion always being below. Galls taken June 18 gave flies June 20. No guests were reared and the galls were little parisitised. Parasites undetermined.

Andricus petiolicola Bass. Galls found common on *Q. alba*, *Q. macrocarpa* and *Q. bicolor*. The galls are formed by the enlargement of a portion of the petiole of the leaf, and after the leaves have fallen the galls stand out like little knotty projections. The galls that I have taken vary from 5-16 to 10-16 of an inch in diameter. Galls taken at Ames, July 3, gave flies July 5. *Ceroptres petiolicola* is a very common guest in this gall.

Cynips dimorphus Ash. ms. Mr. W. H. Ashmead, of the Florida Exp. Station, informs me that he has had this cynip and gall described in manuscript under the above name. Galls, red and globular, two to three mm. in diameter, and arranged in clusters of from 10 to 30 or more on the under side of the leaves of *Q. prinus*, *Q. macrocarpa* and *Q. bicolor* in September and October. Rather common. Galls taken in the fall contained larval cynips on the first of July following.

Cynips strobilana O. S. The gall of this cynip I find quite rare. The galls are easiest found after the leaves have fallen. They have been taken from *Q. macrocarpa* and *Q. bicolor*. The individual galls are irregular, cone-shaped bodies, from fifteen to thirty of which constitute a cluster which always arises from a terminal bud. My largest cluster measures nearly two inches in diameter. Specimens taken last October still contain larvae (Sep. 20).

The guest, *Synergus lignicola*, has been reared from the galls in considerable numbers and also a few parasites belonging to the genus *Eurytoma*.

Acraspis erinacei Walsh. (*C. pisum* Fitch.) Galls common in September and October on the leaves of *Q. alba*, usually on the under side. When growing they are of a beautiful rose or straw color and are covered with short spines or hairs. The gall is exceedingly hard when dry and the surface is made up of little seed-like projections, much resembling the surface of a strawberry. The galls seldom contain less than two or more than five larval cells.

The mature insect emerges in November and is wingless, or, rather, with only stubs of wings.

A very common parasite reared from this gall is *Decatoma flava*.

Biorhiza forticornis Walsh. (*Cynips ficus* Fitch.) Galls occurring near the tips of the twigs of *Q. alba*, almost invariably on young second growth shoots. A hundred or more are often crowded together about the shoots and appear much like a great number of little compressed sacks. When green they are

light yellow in color, but are brown when dry. Common.

A few undetermined parasites only have been reared.

Holcaspis globulus Fitch. Galls globular, from three to six eighths of an inch in diameter, composed of a corky material with an egg-shaped central cell, always occurring on the twigs of *Q. alba*. The fly emerges late in October or early in November.

Decatoma varians, an undetermined species of the same genus, and a species of *Eurytoma* have been reared as parasites on this fly. Common.

Holcaspis rugosa Bass. The gall and the fly of this species resemble very closely those of *H. globulus*. I have found the galls to be more highly colored than those of the latter species, and when matured they have a shriveled surface, while *globulus* is smooth. These galls have been taken on *Q. prinus* only, and are scarce. One guest, *Synergus ficus*, and the parasites, *Decatoma varians*, *Decatoma* sp., *Eurytoma punctiventris* and *Syntomaspis* sp., have been reared from the galls of this species.

Holcaspis duricoria Bass. (*H. mamma* Walsh.) This is probably the gall-fly referred to by Walsh in a foot-note in the *American entomologist*, vol. 1, page 102, for which he suggests the specific name *mamma*. Mr. Bassett described this insect and gave it the specific name *duricoria*, a name that has been accepted by European entomologists. For this reason, and for the farther reason that Walsh's description is not sufficient to distinguish the species with any certainty, I have given Bassett's name the preference.

The galls are very common on the twigs of *Quercus bicolor* and *Q. macrocarpa*. They may appear singly but are usually crowded together in clusters about the twigs. The galls, unless much crowded in the cluster, are sub-globular in outline with a small teat-like projection. The fly, which much resembles *H. globulus*, *H. rugosa* and *H. Bassetti*, began to appear in the breeding cages Oct. 27. Fig. 3 is a full size representation of a cluster of these galls.

Two parasites, *Decatoma varians* and *Ormyrus ventricosus* were reared from this species.

Dryophanta papula Bass. These galls have been taken on *Q. rubra* and *Q. coccinea*. They consist of thickened portions of the leaves that are raised in many sharp points on the upper side. These thickened portions are lighter in color than the surrounding parts of the leaf and each little point seems to mark the location of the larval cell. Flies began to appear July 12. Rare.

The great majority of insects reared from these galls have been parasites of the genus *Tetrastichus*.

Neuroterus noxiosus Bass. The galls are irregular swellings of the twigs of *Q. bicolor*. Galls taken in January gave the mature insects the last of March following. Galls not at all common.

The guests *Synergus lignicola* and an undetermined species of the same

genus were reared. A number of the parasite, *Ormyrus minutus*, were also reared.

Neuroterus vesicula Bass. When the larva of this species is full grown the gall is a thin shell, globular in form, almost black in color, covered with light spots, does not exceed three mm. in diameter and is supported by the bud scales of *Q. bicolor* and *Q. macrocarpa*. Galls taken April 29 gave flies May 3.

Neither guests nor parasite were reared.

(*To be continued.*)

NOTES ON THE PARASITE OF THE SPOTTED LADY-BEETLE (*MEGILLA MACULATA*).[1]

BY CLARENCE MOORES WEED AND CHARLES A. HART.

Our attention was first called to this subject during the summer of 1884 when dead examples of the common spotted lady-beetle (*Megilla maculata*) were found by Mr. Hart on various plants, each having beneath or beside it a compact brown cocoon, about 4 mm. long by 2 mm. wide. The matter was not especially studied at that time, and no further attention was paid to it until 17 July 1885, when several examples of the same kind were found in a corn-field. The lady-beetles were in two cases dead, while in three or four others they were alive and embracing the cocoon with their legs. One of the cocoons attached to a dead beetle had a cap removed from one end, the parasite having doubtless escaped through the opening thus made. The other cocoons were placed in a breeding cage, and the imagos were bred from them.

A living specimen of the same lady-beetle was again found 5 August 1885 on corn, at the base of a leaf, with a cocoon of its parasite entangled in its legs. It was retained alive for examination and acted much as a spider does about its egg-sack. When found, its hind claws were caught in the loose silk of the cocoon, but when the cocoon was removed the lady-beetle seemed greatly disturbed, and would fold its legs about anything within reach. It walked holding its body high in the air, and when it came in the vicinity of the cocoon, its claws would become entangled so that it dragged the cocoon along after it. When placed upon its back it waved its feet

[1] The present paper is mainly an abridgement of a more elaborate one prepared for the Cleveland (1888) meeting of the Entomological club of the American association for the advancement of science (the title of which was sent to the secretary) but as I was unable to reach Cleveland before the club adjourned it was not read. Since the meeting, however, an article covering the main grounds of our paper has been published in *Insect life* (Oct. 1888, v. 1, p. 101-104) by Dr. Riley, but it has been thought worth while to present these additional observations upon the presence and habits of the parasite and its host in Illinois, where all the observations here recorded were made, as a part of the work of the Illinois State laboratory of natural history.

C. M. W.

excitedly as most insects do when in this position; but as soon as the cocoon was placed within reach, it folded its legs about it and became quiet, remaining so although still lying on its back.

Early in May 1886, another *Megilla* was found over a cocoon on a clover leaf, and was transferred to a breeding cage. When next examined, 26 May, the parasite had emerged and the beetle was dead, although still entangled in the cocoon.

Again 18 May 1886 another *Megilla* was found on a currant leaf clinging to a cocoon like those above mentioned. It strongly resisted efforts to dislodge it, and refused to walk when removed — clinging to the leaf-stem or other small object as it had done to the cocoon. No sign of external injury could be seen. When put in alcohol the beetle refused to let go the cocoon until dying.

The same kind of beetle and cocoon were again found by a member of the Natural history society of the University of Illinois at a field-meeting in May 1887, in the woods near Mahomet, in central Illinois, and was shown to most of the members present. The *Megilla* was alive and clung to the cocoon with great pertinacity.

The accompanying illustration, drawn by Miss Lillie Hart, shows the beetle over the cocoon, on a clover leaf.

Description.

The parasite bred by us agrees with the figure given by Dr. Riley of the species bred by him from this coccinellid, for which he has proposed the provisional name *Centistes americana*. He had obtained only female specimens, however, while both sexes are represented in the Laboratory collection. The two sexes may be described as follows:

Length, 2.5 mm. ♂ ♀. Black, somewhat shining, covered with rather long brown hairs; head with palpi and mandibles yellowish brown; black on vertex surrounding ocelli. Abdomen, except tergum of first segment, shining, dark

brown. Antennae as long as body, piceous except at base where they are tawny olive. Mesonotum coarsely punctate, with subtriangular areas adjacent to the insertion of the wings more shining and with fewer punctures; these areas sometimes brownish. Metanotum coarsely reticulate. Tergum of first abdominal segment longitudinally rugosely reticulate, remaining segments smooth and shining. Legs of ♀ dark yellowish

brown, with coxae blackish, and tarsi together with intermediate and posterior femora, obfuscate. Legs of ♂ lighter colored, with coxae unicolorous with legs; posterior tibiae at tip, and posterior tarsi dusky. Tegulae piceous. Wings subhyaline; veins and stigma deep brown. Ovipositor nearly as long as abdomen; sheaths piceous.

Described from four specimens (3 ♀, 1 ♂) bred from cocoons found in connection with *Megilla maculata*.

The cocoon is of a clear reddish brown color, 4 mm. long by 2 mm. wide. Its texture is compact, except that there is considerable loose silk on the outside.

COSMOPOLITAN BUTTERFLIES.

BY SAMUEL HUBBARD SCUDDER, CAMBRIDGE, MASS.

Strictly speaking, there is no such thing as a cosmopolitan butterfly; yet there is one species, *Vanessa cardui*, which may well merit that name, since it is found in every quarter of the globe with the exception of the arctic regions, a part of South America and most of the West India islands; there are also other butterflies whose recent extension naturally leads to the inquiry, What should prevent their spreading over the entire globe, or what are the elements that enable a butterfly to gain and maintain a foothold in so many diverse regions.

Let us look for a moment at the peculiarities of distribution of this nearly cosmopolitan butterfly. It belongs to a subdivision of the genus *Vanessa*, the members of which (with the sole exception of this cosmopolitan species) are found exclusively in the New World; while the antithetical section (with the single exception again of one member found both in Europe and the United States) is exclusively confined to the Old World. Judging from this fact we may venture to assert with considerable confidence that this cosmopolitan butterfly originated in America. *Yet it is just on this continent that its distribution is most limited!* It is known in only a comparatively small portion of South America and occurs on none of the West India islands, with the exception of Cuba, where it is rare. The cause of this limitation cannot be attributed to the food plant of the caterpillar; for the thistles upon which it lives are quite as abundant in these regions as in many others which it has invaded, certainly sufficiently abundant for all its uses. Nor can the heat of the tropics be placed as a difficulty in the way, since there is no place where it flourishes more abundantly than in the tropics and subtropics of the Old World, repeated invasions of Europe by hordes from the south where they had outgrown their opportunities being already on record.

Assuming, then, America to have been its original home, it would seem

as if we might fairly conclude that a butterfly of a dominant type, after its distribution in the region of its birth had reached its limits (the balance between the competitors in the struggle for existence being fairly struck), on being introduced into a new world, where it had to contend in the struggle for supremacy with none of the members of its own restricted group, which had stood in its way in its native home, would suddenly find that it had reached a region ready for conquest and would spread therein with such success as to completely overrun that division of the world.

That this is a probable picture of events which actually transpired in this instance, the result of which we see today, is rendered more probable by other events which have taken place under our very eyes, which, though not strictly parallel, seem to have a lesson. *Pieris rapae*, originating in the Old World among a circle of relatives far greater than exists in North America, relatives whose natural food plant is precisely its own, has been suddenly transported to America, where the group to which it belongs is much more poorly represented in species, all feeding upon plants of the same family; and though there are among them species of the genera *Pontia* and *Pieris* having intimate relationship with forms which have more or less successfully contended with *rapae* in their own home, the inexperience of the American species with such a rude antagonist has made them no match for it; so that in the mere quarter of a century since its introduction it has spread over half the territory of the United States, doing now vastly more injury than all the others of its own tribe combined and contending with them so successfully that their scarcity where formerly abundant is everywhere noticed. In this latter instance commercial agencies are amply sufficient to explain the introduction of this butterfly into our country. It is, however, an insect dependant upon a group of food plants which forbid its passage into the tropics and so will prevent its spread over more than the north temperate zone.

It is plain that no butterfly can become cosmopolitan whose caterpillar does not feed upon plants found in all quarters of the globe. Yet this is plainly not a sufficient cause for distribution. As a proof of this it may be pointed out that one of the most polyphagous of our butterflies, *Jasoniades glaucus*, which has an unusually extended distribution in North America, where it has several allies, has never become cosmopolitan; while plants to which it might easily adapt itself are found in every quarter of the globe. Moreover, the alliances of the genus are wholly with tropical American forms and its ancestors unquestionably originated in that part of the world; yet the genus is not found in the tropics. Nor has it ever spread to the Old World; at the same time there are other genera of the same tribe, not distantly related, which do possess members in both the New and Old Worlds, whose food is of a much more restricted range; such are the genera *Iphiclides* and *Papilio*.

We have another instance of possible cosmopolitanism which is perhaps more

remarkable than any of the others, in the spread, known to be recent, of *Anosia plexippus* which feeds only upon *Asclepiadaceae*, a group of plants found all over the world in temperate and torrid regions. It is remarkable, because *Anosia* belongs to a section of the subfamily nearly all whose other members belong to the Old World, and yet it is in the Old World that it is now achieving its success. In ancient times, some offshoot of the Old World type found its way to the new continent, spread and multiplied, so long a time ago as to have now become differentiated into several different species and genera, one of which, reintroduced through commercial agencies into the home of its forefathers, bids fair to rival its ancient allies. Here then we have a butterfly which may yet become as cosmopolitan as *Vanessa cardui* is to-day, or only less so from its inability to perpetuate itself in regions with severely cold winters.

I do not find among our butterflies any other instance which seems to me likely to aspire to similar honor. But it may be pointed out that *Pieris rapae* is by no means so destructive in Europe as is another butterfly of the same group, *Mancipium brassicae* whose caterpillars, being semigregarious, are capable of much more mischief. Should this butterfly be transported to America (and its chances of such transportation seem to be equally good with those of *Pieris rapae*), it would probably outdo the ravages of *Pieris rapae* and spread as far as it.

Considering the relative abundance in individuals of the species of *Rhodoceridi* above that of those of any other tribe of butterflies, the prevalence of *Eurymi* in the north temperate regions, and that of *Callidryades* in the tropics of the New World, it seems a little surprising that we have among them no single species which has a range at all extraordinary, and no example of widespread distribution through two hemispheres. At least such must be the judgment of one who cannot look upon two forms having an entirely different development in two hemispheres, as holding any right to be considered otherwise than as now distinct species. But there are others who claim an identity of species between some of the forms of *Eurymus* on the two northern continents. In one case, indeed, it would appear that one of our common species of *Eurymus*, *E. philodice*, was introduced by some accident into England, and flourished there for a brief while, but speedily became extinct.

It seems almost equally surprising, considering the dependence of insects upon their food plants, that we find not a single instance of any remarkable distribution among butterflies feeding in their caterpillar state upon *Leguminosae* or upon grasses, although a very considerable number of butterflies affect these particular groups. It is, therefore, plain that besides the universal distribution of its larval food plant, something more is needed to open before any butterfly the possibilities of a cosmopolitan life.

NOTES ON THE EPIPHARYNX, AND THE EPIPHARYNGEAL ORGANS OF TASTE IN MANDIBULATE INSECTS.

BY ALPHEUS SPRING PACKARD., PROVIDENCE, R. I.

Réaumur was, so far as we have been able to ascertain, the first author to describe and figure the epipharynx, which he observed in the honey bee and bumble bee, and calls *la langue*, remarking that it closes the opening into the oesophagus, and that it is applied against the palate.[1] According to Kirby and Spence,[2] DeGeer[3] described the epipharynx of the wasp: and Latreille[4] referred to it, calling it the *sous labre*.

The name epipharynx was bestowed upon this organ by Savigny,[5] who thus speaks of that of the bees: Ce pharynx est, à la vérité, non-seulement caché par la lèvre supérieure, mais encore exactement recouvert par un organe particulier que Réaumur a déjà décrit. C'est une sorte d'appendice membraneux qui est reçu entre les deux branches des mâchoires. Cette partie ayant pour base le bord supérieur du pharynx, peut prendre le nom d'*épipharynx* ou d'*épiglosse*.

He also describes that of diptera What Walter[6] has lately proved to be the epipharynx of lepidoptera, was regarded by Savigny and all subsequent writers as the labrum.

The latest account of the function of this organ is that by Cheshire, who states that the tube made by the maxillae and labial palpi cannot act as a suction pipe, because it is open above. "This opening is closed by the front extension of the epipharynx which closes down to the maxillae, fitting exactly into the space they leave uncovered, and thus the tube is completed from their termination to the oesophagus."

It is singular that this organ is not mentioned in Burmeister's Manual of entomology, in Lacordaire's Introduction à l'entomology, or by Newport in his admirable article *Insecta* in Todd's Cyclopedia of anatomy.

Neither has Straus-Durckheim referred to or figured it in his great work on the anatomy of *Melolontha vulgaris*.[8]

In their excellent work on the Cockroach, Miall and Denny state that "The epipharynx, which is a prominent part

[1] Réaumur, Mémoires pour servir a l'histoire des insectes, v. 5, 1740, p. 318. pl. 28, figs. 4, 7, 8, 9, 10, 11 *l*.

[2] Kirby and Spence, Intr. to entomology, v. 3, 1828, p. 457.

[3] De Geer, v. 2, 1778—v. 26, fig. 11. M. (Kirby and Spence, pl. xii. fig. 2 K.)

[4] Latreille, Organization extérieure des Insectes, p. 184. (Quoted from Kirby and Spence.)

[5] Savigny. Mémoires sur les animaux sans vertèbres. Partie 1re, 1816, p. 12.

[6] Walter, Alfred, Beitge zur morphologie der schmetterlinge. Erster thel. Zur morphologie der schmetterlingsmundtheile. (Jena. Zeits., v. 18, 1885, p. 752.)

[7] Cheshire. Bees and bee-keeping. I. London, 1886, p 93.

[8] Considérations générales sur l'anatomie comparée des animaux articulés, 1828.

in coleoptera and diptera, is not recognizable in orthoptera." (p. 45.)

I am not aware that any modern writers have described or referred to the epipharynx of the mandibulate orders of insects, though I must confess that I have not made extended search after such references and I would be thankful for information and references. Although Dr. G. Joseph[9] speaks of finding them on the palate of almost every order of insects, especially plant-feeding forms, we are unable to find any specific references, his detailed observations being apparently unpublished.

The epipharnyx is so intimately associated with the elongated labium of certain diptera, that, with Dr. Dimmock,[10] we may, refer to the double organ as the labrum-epipharynx; and where, as in the lepidopterous *Micropteryx semipurpurella*, described and figured by Walter,[11] and the *panorpidae*[12] (*Panorpa* and *Boreus*), the labrum seems pieced out with a thin, pale, membranous fold which appears to be an extension of the epipharynx, build ing up the dorsal end of the labrum, this term is a convenient one to use.

In the lower orders of truly mandibulate insects, from the thysanura to the coleoptera, excluding those which suck in liquid food, such as the diptera, lepidoptera and hymenoptera, and the mecaptera (*Panorpidae*) with their elongated head and feeble, small mandibles; the epipharynx forms a simple membranous palatal lining of the clypeus and labrum. It is not, so far as we have observed in any mandibulate insects in which the mouth parts are free, adapted for mastication only, the mandibles being well developed,—in such insects there is no soft projecting or pendant portion, fitted to close the throat or to complete a partially tubular arrangement of the first and second maxillae.

In all the forms, then, described below, the epipharynx forms simply the under surface or pharyngeal lining of clypeus and labrum, the surface being uniformly moderately convex, and corresponding in extent to that of the clypeus and labrum, posteriorly merging into the palatal wall of the pharynx; the armature of peculiar gathering-hairs sometimes spreading over its base, being continuous with those lining the mouth and beginning of the oesophagus. The suture separating the labrum from the clypeus does not involve the epipharynx, though since certain gustatory fields lie under the front edge of the clypeus, as well as labrum, we may in describing them refer to certain fields or groups of cups or pits as occupying a labral or clypeal region or position.

In our descriptions we have called attention to the shape of the front edge of the labrum, whether notched or not, and whether bearing traces of a median suture, on account of the bearing of these parts on the question whether the labrum

[9] Joseph, Gust, Zur morphologie des geschmacksoganes bei inseckten. Amtlicher bericht der 50 verr sammlung deutscher naturforscher u. Artzte in München. 1877, p. 227–228.

[10] Dimmock, George. The anatomy of the mouth-parts and of the sucking apparatus of some diptera 1881.

[11] *Op. cit.*, fig. 3

[12] Packard, A. S. Psyche, 1889, v. 5, p. 159-164.

represents a first pair of antennae. The lack of traces of a suture in the epipharynx corresponding to the labral suture above, suggests that the labrum does not represent a pair of coalesced appendages, and that it, with the clypeus, simply forms the solid epidermal roof of the mouth.

The only soft structures seen between the epipharynx and labrum besides the nerves of special sense, are the elevator muscles of the labrum and two tracheae, one on each side.

The structure and armature of the epipharyngeal surface even, besides the taste-pits, cups and rods, is unexpectedly varied, the setae assuming very different shapes. There seems to be two primary forms of setae, (1), the normal forms which arise from a definite cell, the setae being a hypertrophied nucleus, as first shown by Newport, and (2), soft, flattened, often hooked hairs which are cylindrical toward the end, but arise from a broad triangular base, without any cell-wall, not arising from distinct nuclei. These are like the gathering hairs (Cheshire) on the bee's and wasp's tongue; they also line the walls of the pharynx and extend toward the oesophagus. They are the "hooked hairs" of Will. The first kind or normal setae are either simply defensive, often guarding the sense-cups or sensory fields, or they have a nerve extending to them and are tactile.

It will be seen by the following descriptions that in the thysanura no true gustatory cups or pits have been found; and that immature dermaptera are destitute of them. On the other hand taste-cups occur on the epipharynx of the larvae of longicorn, scarabaeid, and buprestid beetles, and they are as abundantly developed in carabid or carnivorous beetles as in plant-eating coleoptera. Also, within the limits of a family like the *locustidae* they are less abundant in one of the more generalized genera as *Xiphidium*, and more numerous in a highly specialized genus, as *Cyrtophyllus*.

I should say that I have examined the taste-cups of the honey bee, finding that they agree with Wolff's figures, and that those of insects of the orders described below are essentially of the same structure and all seem by situation to be gustatory in function.

Order Thysanura.

Lepisma sp. from Havana. — The specimen examined was one of a number kindly collected for me by the venerable Professor Poey of Havana in his own house. The labrum is slightly excavated along the entire margin, but there is no trace of a median suture; and over the surface, are scattered long acute hairs, while at the base and over the clypeus are thickly planted, singular long setae which are hairy beyond the middle, and are forked at the end.

The epipharynx ends in front in a broad median lobe somewhat as in *Forficula*, the edge of which bears numerous very short cylindrical rods, whose presence can only be distinctly made out by a power of 400 diameters. This lobe is also covered with an exceedingly

fine pile consisting of acutely lanceolate hairs arising from a broad, non-nucleated base; those on the sides, especially in front, being directed towards the middle of the epipharynx, and much coarser than those situated farther back.

There is no median furrow, and no sense-pits, cups or rods, the median region being clothed with fine hairs.

Machilis variabilis Say.—The shape of the labrum and epipharynx is very singular. The labrum is narrower than long, the front edge slightly excavated, and provided with a row of short, stiff, broad, flat setae, which end in a short fork. There are no traces of a median suture.

The epipharynx has no separate median frontal lobe like that of *Lepisma*, but the broad edge simply forms the under surface of the labrum. The edge is provided with a singular armature of about four rows of short thick appressed spines, whose ends turn down a little, so that they appear like four rows of somewhat polygonal paving stones; each has a central nucleus. I can perceive no setae arising from them. Whether these singular shortened and curved rods are gustatory, or in any way sensory, or whether simply defensive, remains to be proved; I could not detect any nerves leading to them. From each side of the end of the epipharynx two series, in oblique rows, of somewhat appressed, rather large, short conical setae, with a nucleus at the end, curve inwards along the distal third of the epipharynx, and thence extend parallel to each other towards the base of the epipharynx. Of these conical setae, those in front when examined with a power of 400 diameters do not appear to bear a bristle, though there is a nucleus at the end; but many of those situated farther back bear a long acute bristle. There is no median furrow, but the median region is very finely pilose, the fine hairs becoming more numerous at the base and extending along the epipharyngeal lining of the clypeus. No genuine sense-pits, cups or rods could be detected.

Order DERMAPTERA.

Forficula sp. from Cordova, Mexico. —The labrum is rounded in front with no traces of a median suture.

Epipharynx with a membranous edge in front, fringed with a dense row of short fine setae, and just within the edge are two or three rows of sinuous, slender, blunt setae, of peculiar shape, which may be possibly gustatory. The surface is covered with very fine scale-like setae, and on each side near the base is a region covered by a short dense pile.

The taste-pits are few in number, there being only about a dozen on each side in all; most of them being situated on the anterior half, and a few near the base. The taste-pits are provided each with a short fine seta, as usual, arising from the centre.

Forficula larva from Florida. — The front edge of the labrum is entire, rounded, and there are no traces of a median suture. The front edge of the epipharynx forms a slight projection or lobe, about half as wide as the labrum, which is fringed with fine setae, some

of which are hair-like, acute, while others are blunt and curved. The surface in general is covered with the usual fine pile. The median area is bordered by a pile-covered area, but along this region no sense-pits, cups, or rods could be detected with a power of 400 diameters; over the region where they usually occur were to be seen scattered conical setae.

Order ORTHOPTERA.

A wingless Blattid from Florida. —The labrum is full and rounded on the front edge, with no indications of a median suture. The surface of the epipharynx is finely and densely pilose. There are no sense pits, cups or rods visible.

Blatta, a large winged species from Cuba. — Front of the labrum slightly excavated. The epipharynx is provided on the front edge with very numerous short, stout, minute setae, which are curved downward, and form when looked at vertically, a pavement-like mass; beyond on the extreme edge is a dense fringe of short slender rod-like bristles. The surface elsewhere is finely pilose, the median region not being bare. On each side of the middle is a curved row of stiff defensive spines; at the distal end of each row is a sensitive field, containing 20 taste-cups on one side and 23 on the other. Near the front edge of the clypeal region are two more sense-fields, situated on each side of the median line, there being 35 taste-cups in each field. The taste-cups in this species are rather smaller than usual.

Spectrum bivittatum Say. — In a specimen from Indian River, Fla. the front edge of the labrum is entire, but along the middle are traces of a median suture. The middle region of the epipharynx, and the epipharyngeal lining of the clypeus are covered with fine and coarse setae, but there is no bare space, and no sense-pits are to be detected. (Those that at first appear to be such are ordinary cells with the setae broken off.)

Camnula pellucida Scudd.— The labrum is notched, but the edge is plain, not bearing any rods or bristles on the border of the excavation, or elsewhere on the labral margin. There is a well defined short median suture in the middle of the labrum which sends posteriorly two forks.

The epipharynx is free from hairs along the middle, and near what corresponds to the front edge of the clypeus, are two sensitive fields, each containing about 35 taste-pits. Just in front under the suture between the clypeus and labrum are two similar fields, each containing from 40 to 42 taste-pits. There are none in front of these.

Xiphidium brevipennis Scudd. ♀. —The epipharynx is slightly notched at the end in the middle and the sinus filled with slender setae. The median line forms a slight furrow, while the surface of the epipharynx in general is covered with fine rather stiff short setae.

Along each side of the median line on the anterior half of the epipharynx are scattered about 30 taste-cups, mostly without, but some bearing rather large and long setae. At the base is a scat-

tered group of seven taste-cups on each side of the base of the median furrow, nearly all bearing a bristle, but some not; all are so isolated from the other true hairs that they are most probably gustatory. On each side of the region corresponding to the front edge of the clypeus is a group of about 30 taste-cups, only one or two of the outer ones of which seem to bear a bristle.

Cyrtophyllus concavus Scudd.—End of the labrum notched and the sinus filled in with stiff blunt bristles, this area extended back on the epipharynx; there are distinct traces of a median suture. Along the middle of the epipharynx the spines are absent. The taste-cups are arranged much as in *Xiphidium*, but they are more numerous, as might be expected, this genus being in general the more specialized. There are from 50 to 60 taste-cups in the front region: behind the middle a group of 25 on each side, and over an area corresponding to the base of the labrum and front edge of the clypeus is a sensory field with about 70 taste-cups on each side. They are true cups or beaker-like papillae, some with a fine, others with a short, stout, conical seta. The katydid is thus provided with about 170 to 180 taste-cups on its epipharynx.

Anabrus simplex Hald.—Front edge of the labrum full, though there are traces of a median suture. The surface of the epipharynx is covered with stout setae. Along the median furrow of the epipharynx which is bordered with a delicate pile, are scattered, especially near the base, a few peculiar taste-cups, each bearing a very short conical seta, which is larger and shorter than usual the furrow not being pilose. At a point situated near the anterior edge of the clypeus the heavy spines towards the middle graduate into what appear to be sense-cups.

Ceuthophilus maculatus (Harris).—Labrum slightly excavated. Surface of the epipharynx finely pilose. Front edge at the middle forming a highly specialized pilose area, excavated on the edge, the sinus being broad and shallow and the edge lined with a hedge-like row of close-set gustatory rods. A well marked median furrow, free from hairs or bristles, and in front is a group, 30 on each side of the median line, of raised papillae—like taste-cups, a little shorter and broader than those of *Hadenoecus*. At the base of the labral region on each side of the median line is a sensory field of 25 taste-cups arranged in quite regular rows. On the anterior clypeal region is a group of 9 or 10 scattered taste-cups which are shorter, more like cups and far less numerous than in *Hadenoecus*.

Hadenoecus subterraneus Scudd.—In specimens from White's Cave near Mammoth Cave, Ky., the front edge of the labrum is peculiar from the very deep, narrow median pouch-like sinus, which enlarges towards the bottom, and opens out on a median projection, which, as well as the sinus, is fringed with coarse spines, which at the mouth of the sinus become curved. The taste-cups are highly developed in this cave-cricket, being rounded papillae with the

nucleus at the top or end. They are grouped on each side of the middle near the front edge, there being 25 on each side. An irregular row of these cups extends along each side, some occur under the base of the labrum, but they are most numerous on a field corresponding to the front edge of the clypeus, there being 50 on each side, or 100 in all, where in *Ceuthophilus* there are only 9 or 10.

The gustatory cups being so much longer, better developed and much more numerous in the cave *Hadenoecus* than in *Ceuthophilus*, which lives under stones, etc., out-of-doors, it would seem as if the sense of taste were much more acute in the cave-dweller than the out-of-doors form, though it does live for the most part in twilight.

Conocephalus ensiger Harris, ♀.—The epipharynx is full in front, with a deep, narrow, median furrow or gutter along which the liquids probably pass into the throat. At the end is a fringe of fine bristles. On the clypeal region there are about 25 taste-cups, a few projecting over the edge of the gutter; a few more are scattered along the gutter to near the end of the labrum.

Gryllus sp.—In the common black cricket the labrum is rounded in front with a median excavation, the sinus being fringed with rather long, stout, flat, truncated setae, which are longer on the sides than in the middle. There are traces of a longitudinal suture.

The surface of the epipharynx is covered towards the front with fine hairs; on the sides in front are large coarse spines, and at the base is a large area covered with coarse, defensive spines, directed inwards towards the median furrow, which is free from setae.

Taste-cups are abundant; in front, at some distance from the front edge is on each side a group of conical rounded cup-like papillae, carrying the nucleus at the top, there being about 30 arranged in four very regular rows. Nearer the middle is a group, on each side of the middle of the furrow, of 8 taste-cups which are situated just in front of the ends of two curved tracheae. On the outside of the tracheae is a linear group of about 60 taste-cups extending from the base to near the isolated group of 8 cups. Another sensory field containing 45 taste-cups on each side of the median line, or 90 in all, scattered over the area, is situated under the nose of the labrum and front edge of the clypeus, most of them behind the labrum. There is also a lateral group of about 14 taste-cups on the outer edge on the front region of the clypeus and situated outside of the base of the curved tracheae. The sides of the epipharynx under the clypeus are clothed with fine "gathering" or "hooked hairs."

Oecanthus niveus Serville ♀.—The shape of the labrum and epipharynx, as well as the number and distribution of the taste-cups, are almost exactly as described in ***Conocephalus ensiger.***

(*To be continued.*)

ENTOMOLOGICAL NOTES.

ENTOMOLOGIST FOR MINNESOTA. — A recent number of *Entomologica americana* states that Mr. Hermann Oelrichs is the entomologist of the Minnesota experiment station. This is a mistake as Mr. Otto Lugger the original appointee still holds the position.

COLORADO BIOLOGICAL ASSOCIATION.—The reorganization of the Colorado ornithological association under the above name is announced. Mr. T. D. A. Cockerell, the secretary of the newly organized society, has already written many articles on North American insects for English and American entomological journals, and is at present engaged on a "Bibliography of Colorado entomology" for the new association. *G: D.*

SPIDER POISONS. — Professor Breeger has recently investigated the poisons of spiders. He found that the Russian varieties of spider, *Phalanchium* and *Trochosa* (tarantula), are non-poisonous, but that a third, *Caracurt* or "black wolf," secretes a powerful poison, forming 25 per cent of its whole weight. This substance is a peculiar unstable alkaloid, destroyed at 60° C., or by alcohol. Introduced into the circulation of warm-blooded animals, one-thirtieth of a milligram per kilogram of the animal treated was sufficient to cause death. It exceeds in power all known vegetable principles, and prussic acid being comparable in toxicity with the poison of snakes. — *Sci. american*. 17 Nov. 1888, v. 59, p. 310.

NEW SCIENTIFIC JOURNAL.—Contributions to science by Charles J. Maynard, a new quarterly (No. 1, April, 1889) published by the author at Newtonville, Mass., contains a description with figures of the defensive glands of *Anisomorpha buprestoides*.

G. D. SMITH COLLECTION OF BEETLES.—Mr. F. C. Bowditch has purchased the large and valuable cabinet of beetles formed by the late Mr. George D. Smith of Cambridge, Mass. According to an enumeration made several years ago by Mr. B. P. Mann, this collection contained more than 8900 species and 37,000 specimens. With this addition Mr. Bowditch's collection ranks among the largest in this country.

AGRICULTURAL EXPERIMENT STATION REPORTS. — The Cambridge Entomological Club desires to obtain as full sets as possible of all reports of state experiment stations established under the Hatch bill, in so far as these reports contain entomological matter. Up to the time of writing the librarian has received bulletins from the states indicated by an asterisk below. For the benefit of our subscribers we append a list, as accurate as we can now make it, of the addresses of those stations that have entomologists. We should be glad to receive additions and corrections for this list.

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Mass.*	Prof. C: H: Fernald, Amherst.
N. Y.*	Prof. J: H: Comstock, Ithaca.
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Ind.	F. M. Webster, Lafayette.
Neb.	Lawrence Bruner, Lincoln.
Kans.*	Prof. E. A. Popenoe, Manhattan.
Cal.	F. W. Morse, Berkeley.

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CONTENTS:

ADVERTISEMENTS 202
THE FEMALE OF EUTERMES RIPPERTII.—*Hermann August Hagen* . . . 203-208
SECOND CONTRIBUTION TO A KNOWLEDGE OF THE AUTUMN LIFE-HISTORY OF CERTAIN LITTLE KNOWN APHIDIDAE.—*Clarence Moores Weed* 208-210
NORTH AMERICAN TYPHLOCYBINI.—*Charles William Woodworth* . . . 211-214
NOTES ON CERTAIN CYNIPIDAE WITH DESCRIPTIONS OF NEW SPECIES.—*C. P. Gillette* 214-221
NOTES ON THE EPIPHARYNX, AND THE EPIPHARYNGEAL ORGANS OF TASTE IN MANDIBULATE INSECTS.—*Alpheus Spring Packard.* 222-228
VARIATION OF COLOR IN THE LARVAE OF SPHINX GORDIUS.—*Ida M. Eliot and Caroline G. Soule* 228
PROCEEDINGS OF SOCIETIES—*Colorado Biological Association* . . . . 228.

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PSYCHE.

THE FEMALE OF EUTERMES RIPPERTII.

BY HERMANN AUGUST HAGEN, CAMBRIDGE, MASS.

The ovarium of the imago.

The dark colored, mature-winged imago, taken out of the nest *before* swarming (therefore before copulation) was dissected. The color of the ovarium is pale and whitish. Each ovarium is connected within the ends of the metathorax with the dorsal vessel by a very fine filament. The end of the filament measures only .003 mm. in thickness, and in the middle between the insertion and the sudden dilatation of the ovarium the filament is .023 mm. in thickness. Each stigma sends a very large bundle of tracheae to the external part of the ovarium. Where the first bundle reaches the ovarium a rounded dilatation is to be seen, and from here the ovarium increases slightly. Nevertheless, its thickest part, just before the oviduct, though containing some eggs in an advanced stage of development, is only .512 mm. in thickness. The internal half of the whole length of the ovarium is somewhat paler and consists apparently of the filaments of the egg tubes, one running very near to the other, without any twisting and all so closely connected, that a separation is impossible. I was not able to observe in this internal part any tracheae. The external part is visibly darker and provided with very numerous tracheae. The bundles of the tracheae reach the ovarium in a horizontal direction in the beginning of the abdomen; those that follow go obliquely from behind forward to the ovarium, and rise there from a single main stem of .118 mm. in diameter, while the two bundles in the beginning of the abdomen rise from two or three smaller main stems. Just before reaching the ovarium, the main stem of the tracheae is suddenly divided into very numerous smaller branches, which enter the ovarium, divide again like a braid between the filaments and are curved there to provide the interior of the ovarium. Some remain externally on the superficies of the ovarium, and are divided into very fine branches running in an irregular, meandrous manner. The finest I was able to measure, were .003 mm. in thickness. Following the last attached bundle, the ovarium is pear-shaped, dilated, the egg tubes visible and dilated, and filled with a number of eggs, the largest ones, a dozen or more, of dark amber color and of the

same size as the ripe eggs of the queen. The size of the eggs before these diminish rapidly; only eight or nine were developed, and very similar to those in the queen; the three eggs in advance of the last one are darker with a series of elongated cells on each side; those before them shorter, nearly quadrangular, paler, all with a germinal vesicle and dot. Then come very small compartments, with egg-cells in transversal rows and farther on irregular cells in large numbers and very near together. The oviduct is inserted on the inferior end of the ovarium, just on the centre of its inferior end, first somewhat enlarged, then cylindrical, .157 mm. in thickness, and .641 mm. in length to the point, where it meets the oviduct of the opposite side; both forming together from here the large oviduct. The egg-canal in the centre of the ovarium does not reach beyond the point where the first (near the tip of the abdomen) bundle of tracheae is attached, and increases therefore later in length by the successive development of the ovarium.

The ovarium of the queen.

A queen of *Eutermes rippertii* .24 mm. in length, the abdomen .20 mm. long and .08 mm. in thickness, was dissected. After removing the dorsal part of the skin the whole abdomen appeared to be filled by the two ovaria. The queen was perhaps an old one, as there was very little fat along the outer side of the ovarium. In a queen of *Termes gilvus* and in another of *E. rippertii* a large layer of fat very richly provided with tracheae was found outside along the ovarium. Probably this fatty layer had been used up by the dissected queen of *E. rippertii*, as the rich net of tracheae was connected more closely below with the ovarium.

Each ovarium seen from above is a large cylinder, and both are placed so close together, that only a small median furrow for the dorsal vessel remains above between them.

The whole surface of the ovarium is light yellow and consists of very small egg tubes, beginning seemingly on the inner border of the ovarium, and forming bundles in the shape of flattened braids, running backward somewhat and later incurved outwards, winding down to the under side of the ovarium.

The basis of the ovarium near the end of the abdomen is thick, rounded and globular. The apex of the ovarium near the thorax follows strictly the outline of the abdomen, is somewhat globular but on the top has a more contracted part, adapted to the smaller size of the first abdominal segment. This part consists also of braids of egg tubes, arranged similarly to the parting of the hair. A small, cylindrical, yellow prolongation situated internally near this part reaches farther into the thorax to the dorsal vessel. This yellow cylinder is short, .139 mm. in thickness and ends with a quadrangular, somewhat hand-shaped, internal dilatation, concave below, and meeting the similar dilatation of the opposite ovarium. The yellow cylinder is formed of the filaments or thread-like ends of the egg tubes, closely

pressed together. From the external and anterior border of the hand-shaped dilatation a large number of more or less isolated, white, hyaline filaments .008 mm. in thickness, reach farther up to the dorsal vessel. These filaments are empty within, very small nuclei are attached to it externally, and a number of epithelial cells of different size, the largest .01 mm. in diameter, lay near by or around them. I believe that the hyaline filaments are parts of the external coat of the dorsal vessel, torn off by the dissection. Indeed, one or two are isolated, but the larger part form flattened slips. These parts are always very difficult to dissect, particularly in alcoholic specimens. In a large queen dissected by me many years ago, I was fortunate enough to prepare the dorsal vessel without separating the attachment of the ovaria, forming a thicker fatty ring around the whole dorsal vessel, and the same fact was stated to be true with the queen of the honey bee by Dr. Knoch of St. Petersburg.

In another queen of *E. rippertii* the insertion of the ovaria to the dorsal vessel was carefully prepared.

Shortly before the dorsal vessel is inflated to the metathorax to send down the smaller aorta, the filaments of both ovaries are attached to the under side. The attachment is very firm and covered above and below with muscles; therefore, torn-off parts of the dorsal vessel and muscles are retained, forming a somewhat hand-shaped process.

Both filaments are united in a semicircular curve, so that as far as I can observe the two ovaria are fused together. At least I was not able to see any end of the filaments. The winged muscles in which the side vessels are laying (W. Peters Reise nach Mozambique, 1862, Vol. 5, Neuroptera by H. A. Hagen, p. 75, pl. 4 fig. 3) send a triangular bunch above the filament and another below, both inserting partly on the dorsal vessel partly on the filament, originating on each side of the dorsal vessel in an elongated bundle of fat and epithelial cells. I tried polarization to see better the difference between the muscles and filaments without success, the number of the muscular fibres being too large, and strongly mixed by their insertion of the filaments, even running along their interior curved border.

The ovarium seen from the side is near the thorax only half as thick as near the end of the abdomen; it is gradually enlarged, the basis rounded, globular. The internal side of the ovarium is straight and flattened, as both ovaria are very near each other. The yellowish cylinder of the apex of the ovarium is prolonged along the internal side in a yellow flattened band 1 mm. broad, running in a straight line a little below the upper border of the ovarium, which is convex and formed by the beginning of the braids. Therefore when the bands of both ovaria are laying close together, there is always left above them a small groove for the dorsal vessel. The inferior border of the band is straight, very sharp and separated somewhat from the ovarium. The band has entirely the shape and the appearance of a tendon, which towards

the end of the abdomen is divided into divergent and downward bent branches. The band as well as its cylindrical, apical prolongation is formed by the fine filaments of the egg tubes very closely pressed together. There does not exist a separate thread beginning at the base of the abdomen and united with the filaments of the following tubes, as observed by Mr. Stein in other insects. So far I was able to follow the filaments each of them is prolonged to the apex, all running together. I was not able to find a connection in a loop of the ends of the filaments, as observed by Mr. Leydig in other insects, but I confess that I was not able to separate the ends, which are very delicate.

The ovarium is covered below the bands with braids of egg tubes just as above, but towards the base tubes with more developed eggs or even ripe eggs begin to be visible and become by and by prevailing. Of course this will be different in young queens; in one of *T. gilvus*, for instance, the whole ovarium was covered with braids, and only after removing them the more developed eggs appeared.

An egg-canal (the beginning of the oviduct) extends through the whole ovarium, the calyx of Dufour and Stein. It is situated in the centre of the ovarium and begins blind near the first segment of the abdomen, runs at first straight, but soon makes a flattened curve downward to the middle of the length of the ovarium, followed by a similar flattened curve upwards. In the last fourth of the ovarium the canal is sloping down, and shortly before the end bent downwards and inwards, and continued in a free, short, cylindrical tube, meeting the canal of the opposite side, where the oviduct begins. This egg-canal is pale yellow and somewhat fleshy, at the beginning .32-.38 mm. in thickness and becomes gradually thicker, towards the end it is .64-.77 mm. It begins as a hollow tube, just large enough to allow the passage of one egg, but the part near the oviduct is always somewhat dilated, when the eggs have to pass through it.

Around the egg-canal the egg tubes are perpendicularly inserted so near each other, that nothing of the outer surface of the egg-canal remains free. Every egg tube is inserted in a short fleshy cylinder, with a concave dish on top, and a hole in the middle, much smaller than the egg. I counted around the blind beginning of the egg-canal six to eight cylinders, but a part taken out of the middle of the ovarium showed about ten to twelve cylinders, very irregularly placed, and about 20 rows in a part of the egg-canal of 4 mm. in length. The cylinders are .3 mm. in length and less thickened. A part of the egg-canal of 4 mm. in length possesses at least 240 cylinders, and as the egg-canal by its curves is longer than the ovarium, there must be at least 1500 cylinders and egg tubes. But as the insertion towards the end of the abdomen is very irregular and closely pressed, I believe even this number is probably too small. The whole substance of the egg-canal is very brittle, at least in alcoholic specimens.

The egg tubes are unequal in length; those nearer to the thorax are the shortest, and inserted directly in the beginning of the egg-canal; those nearer to the tip of the abdomen are the longest, and, being incurved, may be somewhat longer than the ovarium. I think it by no means improbable that the fine filaments of all the egg tubes may reach the dorsal vessel. At least I was not able to find the end of any filament before that point, and the finest filaments in the band measures only .001 mm. in thickness. Therefore the cylindrical prolongation at the apex of the ovarium .139 mm. in diameter would be thick enough to contain several thousand filaments, as they are here thinner than in the band. The white hyaline filaments originating from the border previously described belong to the hand-shaped dilatation and cannot be connected with the egg tubes, being of a much larger diameter, .008 mm.

The beginning of the egg tubes was empty in the queen of *E. rippertii*, only later they are filled with irregularly placed nuclei; but the apparently younger queen of *T. gilvus* showed the egg tubes filled with such nuclei directly from the beginning of the tubes. Then follow elliptical epithelial cells with nuclei, placed one after the other. The tube of .016 mm. diameter begins to show short transversal compartments, each with three rows of transversally placed egg-cells, followed by somewhat irregular compartments, containing rounded cells each with a germinal vesicle and dot; the cells are placed very nearly together. Then follow quadrangular compartments with a single egg, filled with epithelial cells with nucleoli, and series of elongated cells about ten in number along each side. These compartments become by and by more elongated, with eighteen elongated cells on each side, the contents of the eggs grow darker, and the germinal vesicle smaller. The following eggs are filled with globular cells each containing a strongly reflecting dot, and later suddenly after three or four successive larger ones appear ripe eggs of dark amber color with a less visible germinal vesicle. They are .106 to .113 mm. in length and .076 to .079 mm. in thickness; the germinal vesicle is .033 to .035 mm. in diameter, the germinal dot .006 to .008 mm. in diameter. These eggs have sixteen to eighteen cells along each side, and eight to nine such cells along the smaller sides. The longer sides of the compartments are rounded. The size of the eggs increases till they are ready to be laid. I took several measures of eggs .118 mm. in length and .102 mm. in thickness with a germinal vesicle of .102 mm. in diameter and a germinal dot of .015 mm. in diameter; of riper eggs .307 mm. in length and .256 mm. in thickness; the largest eggs .710 to .769 mm. in length and .318 to .581 mm. in thickness. The disc of the cylinders in which the egg tubes are inserted measures .217 to .256 mm. in diameter, and the central hole, through which the egg has to pass .038 to .051 mm.; therefore this hole has to undergo a remarkably large dilatation, about ten times its diameter to

allow the passage of the largest eggs.

There are nowhere the so-called compartments for nutrition; each egg follows the other, but the ripe ones are connected by darker funiculi, containing epithelial cells, and around them rounded cells with a nucleus. The interior membrane of the egg tubes is structureless and hyaline, not very easily seen. The exterior membrane is fibrous, and around the larger eggs shows often lacunes and holes filled with epithelial cells with nuclei. The connecting parts around the lacunes are often small and of decided muscular appearance. In the part between two eggs the membrane is striated longitudinally.

The chorion of ripe eggs in the tubes shows sexangular spaces, the borders between them comparatively wide and hyaline. The centre of these spaces are darker and filled with pavement cells, round, of .015 mm. in diameter, with numerous fine dark spots.

I was not able to find the micropyle in eggs contained in the ovarium. The micropyle of laid eggs is dorsal a little before the inferior pole; there are ten to twelve little holes somewhat different *in situ*, forming small funnels with a stem as long as the diameter of the holes. Near them numerous filiform spermatozoa (?) were seen. The eggs are cylindrical, concave on one side, the ends rounded a little; often one end thicker; the yolk corpuscula .012 to .025 mm. in thickness.

The dissected queens of *E. rippertii* were from Jamaica and Cuba, of *T. gilvus* from Rangoon, Burmah. *E. rippertii* is probably the long sought for imago of *Termes devastans*, Kollar. The above is a part of a proposed monograph of the anatomy of the *termitina* for which a large number of figures have been made.

SECOND CONTRIBUTION TO A KNOWLEDGE OF THE AUTUMN LIFE-HISTORY OF CERTAIN LITTLE KNOWN APHIDIDAE.*

BY CLARENCE MOORES WEED, COLUMBUS, OHIO.

The present paper is the result of a continuation of the study of the autumn life-history of the *aphididae*, begun in Illinois in 1887. The observations here recorded were made at Columbus, Ohio, during the autumn of 1888, upon the grounds connected with the Ohio State University.

MELANOXANTHUS SALICTI (HARRIS).

This species was first described by Dr. Harris in his treatise on insects injurious to vegetation as *Aphis salicti*.* In the Flint edition of the Treatise, however, Mr. Uhler states in a foot-note that the specific name had been "long ago appropriated by

* For the first article of this series see *Psyche*, Nov.-Dec., 1888, v. 5, p. 123-134.

* 1st ed., 1842, p. 190-191; 2nd ed. 1852, p. 208-209 Flint ed., 1862, p. 239.

Schrank to a very different species of *Aphis* inhabiting Europe," and suggests that the American species "might be called *Aphis salicicola*."

The insect was again briefly discussed as *Lachnus salicicola* by Dr. Cyrus Thomas in 1878.* and finally in his Synopsis of the *aphididae* of Minnesota,† Professor O. W. Oestland refers the species to *Melanoxanthus* and restores the name originally given by Harris, which, he says, "is not occupied when applied to this genus."

The only forms of the species as yet described are the viviparous ones.

My observations upon the insect began in October, 1888, when I found it very abundant on the twigs of a species of willow (*Salix*) growing in the bottoms of the Olentangy river on the Ohio State University farm. The sexed forms were present in great abundance and could be seen mating, while many of the females were busily engaged in oviposition. The following descriptions were drawn up from living specimens.

Winged male.

Length, tip anterior to tip of folded wings	7.50 mm.
Length of body	2.50 mm.
Wing expanse	9.00 mm.

Body small; bluish black, with glaucous bloom. Legs very long, hairy; coxae unicolorous with body; femora and proximas $\frac{1}{2}-\frac{2}{3}$ of tibia reddish brown; apical portion of tibiae together with tarsi, black. Antennae long, hairy, black throughout; joints I and II short, subequal; III, long, $\frac{1}{3}$ longer than IV, which is also about $\frac{1}{3}$ longer than V; VII slightly longer than VI; joints III to VII roughened with numerous sensoria; cornicles vasiform. Prothorax with a blunt tubercle on each side. Wings hyaline; veins brownish; wing insertions generally greenish black.

Described from numerous specimens taken on twigs *Salix* sp., 29 October 1888. Some of them seen *in copula* with oviparous females.

Oviparous female.

Length of body	3.00 mm.
Width of body across abdomen	1.50 mm.

Body bluish black, with a glaucous bloom. Legs hairy; coxae unicolorous with body; femora and proxima $\frac{1}{2}$-$\frac{2}{3}$ tibiae yellowish brown, and apical portion of tibiae together with tarsi black. Antennae hairy; joints I and II unicolorous with body, proxima $\frac{2}{3}-\frac{3}{4}$ of III yellowish brown, and the remainder black: joints I and II short, subequal; III longest of any but shorter than IV + V; IV slightly longer than V; VI and VII subequal: V, VI, and VII roughened with numerous sensoria. Prothorax with a blunt tubercle on each side. Cornicles short, vasiform, flanged at tip; orange yellow. Rostrum blackish, reaching anterior margin posterior coxae.

Described from many specimens collected on twigs of *Salix* sp., 29 October 1888.

* 8*th* rept. State ent. Ill., p. 115-116.

† Geol. and nat. hist surv. of Minn., Bull. No. 4, p. 36.

Egg.

Length 1.00 mm., oval, greenish at first but becoming black in a short time. Deposited on bark of twigs, especially about buds.

MYZUS RIBIS (LINN.).

Notwithstanding the abundance and destructiveness of this species, its life-history does not seem to have been traced, nor the sexed forms described.

During the past season I observed the habits of the species which was abundant on the currant bushes in my garden, finding that the lice left the bushes early in summer but was unable to learn to what plant they migrated. In September winged viviparous females returned to the currants and gave birth to young which developed into oviparous females. The winged males flew in from some other plants, presumably being developed on the same plant as the migrating viviparous females which gave birth to the oviparous form.

Winged male.

Length of body . . .	2.00 mm.
" " antennae . .	2.70 mm.
" " cornicles . .	0.50 mm.
Wing expanse	8.50 mm.

Antennae, head, band on dorsum of prothorax, row of dots on each side of dorsum of abdomen, and transverse patch back of middle of same, black. Legs very long, with coxae, apical half of femora, and apical fourth of tibiae, together with tarsi, black, the rest being yellow. Cornicles long, slender, slightly incrassate. Antennae about ⅓ longer than body, slender, roughened with numerous sensoria; joint I large, thickened, about as long as II; III longer than any except VII; IV and V subequal; VI shorter than V; VII very long and slender. Cauda minutely tuberculate, with several curved stiff hairs arising from the margin.

Described from several specimens taken on under surface of cultivated currant leaves, 31 October, 1888.

Oviparous female.

Length . . . .75 mm. to 1.00 mm.

Body globose; greenish, shade varying with age of specimen. Antennae pale at base but blackish apically, and at articulations. Legs pale, articulations and tarsi dusky; the thickened posterior tibiae greenish brown. Antennae short, less than half the length of the body: 6-jointed; joints I and II short, subequal; III and VI subequal, both longer than any of others; IV and V subequal, each about ⅓ shorter than III; joints III to VI strongly tuberculate, having numerous sensoria. Cauda long and large, spinosely tuberculate, with several long curved hairs arising from its dorsal surface. Rostrum reaching posterior margin of second coxae.

Described from many specimens taken on under surface of leaves of cultivated currant, 31 October, 1888.

In some specimens two large eggs were plainly visible. I did not find the eggs *in situ* but there is little doubt that they are deposited on the twigs, especially about the buds.

NORTH AMERICAN TYPHLOCYBINI.

BY CHARLES WILLIAM WOODWORTH, FAYETTEVILLE, ARK.

Although the prettiest and daintiest of the whole family, the group *typhlocybini* is the least known to entomologists, at least in this country In order to call the attention of collectors to them I will attempt to straighten out the generic groups into which they are arranged and review what is known about our native species.

The insects composing this group were included by Linnaeus, Fabricius and Zetterstedt in the old genus *Cicada* and by Germar, Herrich-Schaffer and Say in *Tettigonia*. In 1832 Curtis (Ent. mag. v. 1) made for these insects a new genus for which he proposed the name *Eupteryx* and cited *C. pictae* Fabr. as the type. He did not have correct views as to the limitation of the genus he established for we find him in his later works including in it some insects belonging to the genus *Cicadula*. The next year, 1883, Germar (Silb. Rev. Ent. v. 1.) applied the name *Typhlocyba* to the same insects and his name has been generally adopted by entomologists although the English hemipterologists have stoutly contested for the priority of *Eupteryx*. In proposing the name Germar simply mentions the following species as forming the genus: "*Cicada aurata*, *urticae vittata*, *picta*, *quercus*, Fabr., etc." Now it is evident that one of these species must be taken as the type of the genus and as all except *quercus* belong to *Eupteryx* in its most restricted sense this species is the type. The name *Typhlocyba* has been used as far as I can make out only for insects of the group *typhlocybini* possibly Fitch and Walsh may have included a few species of *Gnathodes* and *Cicadula*.

In 1840 Zetterstedt (Insecta Lapponica) included the species of this group in his genus *Cicadula*, but as I have already shown (Psyche, v. 5, p. 75) the genus *Cicadula* as first and naturally restricted excludes these forms. In 1850 Hardy (Trans. Tyneside nat. field club, p. 423) published a new British genus *Dicraneura* which seems to have been for a long time unnoticed, partly perhaps on account of its obscure place of publication and partly on account of the indisposition of European entomologists to dismember the old genus *Typhlocyba*. The next year Fitch (Rep. on state cab. Nat. Hist. N. Y. 1851, p. 62-64) ignoring or overlooking the genera already proposed made two new genera *Erythroneura* and *Empoa* for our North American species. These he separated by the possession of a quadrate cell in the apex of the elytron in the first and a triangular one in the second genus, but this character is not of generic, or even of specific value as can be proven by examining a large series of specimens of any species. I have even seen the

two forms of venation on the two sides of the same insect. All the species mentioned or described by Fitch belong to *Typhlocyba* except *fabae* of Harris. The latter was only incidentally mentioned by him as belonging to *Erythroneura* so I think it is the proper course to consider both his genera as synonyms of *Typhlocyba*. Fitch was soon aware that his genera covered the same ground as the European genus *Typhlocyba*, and five years afterward in his annual report for 1856, published the same year, he attempts to restrict the genus *Typhlocyba* to a group of insects unknown to Germar. In this he has been followed by no one but Walsh and it is an unwarranted restriction. Walsh in this same year published in the Prairie farmer and also separately (reprinted in Proc. Boston, soc. nat. hist. v. 9, p. 314-318) an article in which he makes two more genera *Chloroneura* and *Empoasca* parallel with those of Fitch and separated by the same character. They form a single genus distinct from any yet described which we will call by the shorter and euphonious name *Empoasca*.

In his "Neue gattungen" Fieber (Verh. zool.-bot gesell. in Wien 16, p. 506-509) made ten genera of the European species indicating types as follows:

Compsus elegantula H-S.
discicollis H-S.
albostriellis H-S.
Erythria areolata Fall.
Notus flavipennis Zett.
furcipatus Flor.
orichalceus Dahlb.
Chloria viridula Fall.
pura Stal.
Kybos smaragdulus Fall.
commisurallis Stal.
Anomia quercus L.
Zyginia nivea Muls.
Idia scutellaris H-S.
pullula Boh.
Typhlocyba lineatella Fall.
Eupteryx vittata L.
urticae Fabr.

He made the same error that Walsh and Fitch had in dividing the group on insufficient characters so that some of his genera had to be abandoned and two of the names (*Compsus* and *Chloria*) were preoccupied. These latter were changed by him in his "Katalog der Europaischer Cicadinen" [1872] to *Alebra* and *Chlorita*. In this same work he unites *Erythria* with *Notus* and *Idia* with *Zyginia*. The year previous Sahlburg [Cicadaria 1871] had united *Zyginia*, *Anomia* and *Idia* with *Typhlocyba* and also *Chloria* with *Kybos*. The last two he called erroneously *Cicadula*. In 1875 Douglass (Ent. mo. mag. v. 12) substituted the older name *Dicraneura* for *Notus* and now after putting in our North American genera the synonymy stands as follows:

Alebra Fieber
Compsus Fieber
Empoasca Walsh
Chloroneura Walsh
Kybos Fieber
Chlorita Fieber
Chloria Fieber

Dicraneura Hardy
Votus Fieber
Erythia Fieber
Typhlocyba Germar
Erythroneura Fitch
Empoa Fitch
Idia Fieber
Anomia Fieber
Zyginia Fieber
Eupteryx Curtis.

These genera may be very readily distinguished by the following synopsis:

A marginal vein extending all around the posterior wing parallel with the margin.

Elytra margined posteriorly. *Alebra.*

Elytra not margined.

Two apical cells in the posterior wing. *Dicraneura.*

One apical cell in the posterior wing. *Empoasca.*

No marginal vein at the tip of the posterior wing so that here the veins end in the margin.

The first two longitudinal veins uniting before reaching the margin. *Typhlocyba.*

All four veins attain the margin. *Eupteryx.*

North American species have been described as follows: by Say (Proc. acad. nat. sci. Phila., v. 4, 1825; Compl. works, v. 2, p. 259) four species; Harris (Encyclopaedia Americana 1831 and Injurious insects 1841) three species. Fitch (Rep. on state cab. nat. hist., N. Y., 1851) and (Third report on the noxious and other insects of the state of New York 1856) eight species; Stal (Stett. ent. zeit. v. 19, p. 195–196) three species Walsh as cited above thirteen species. Uhler (Bull. U. S. geol. surv. v. 3, 1877) one species and Forbes (13th rep. Ill. state entomologist 1884) one.

To *Alebra* belongs *aurea*, *pallida* and *binotata* of Walsh but the descriptions are so meagre that no one can certainly say that they are distinct. I know quite a number of very pretty forms of this genus still undescribed.

Of the described forms of the genus *Empoasca* we may make four groups of what may be but four species. The first includes *fabae* of Harris, *viridescens consobrina* and *malefica* of Walsh and *pura* of Stal which are uniform green without markings. Second *obtusa* and *maligna* of Walsh which are certainly not distinct from each other but differ from the first in having a much more obtuse vertex. Third *albopicta* of Forbes which is distinguished by the white markings on the vertex. And fourth the brilliant *aureaviridis* of Uhler.

Dicraneura is represented by *abnormis* of Walsh and *carinata* of Stal which may not be different.

In the genus *Typhlocyba* we have one of the most variable species in existence as regards the coloring, the so-called grape thrips *Typhlocyba vitis* of Harris. Just how many of the forms described as distinct species of this genus will be found to be varieties, of course it is impossible at present to say, but certainly half of the colored species so far described have been definitely made out to be varieties. The colored species are *vitis* of Harris *basilaris*, *comes*, *obliqua*, and *trifasciata* of Say, *vulnerata*, *tricincta*, *coccinia*, *vitifex* and *affinis*

of Fitch and *ziczac* and *octonotata* of Walsh. The unicolorous species are *querci* Fitch *commissuralis* Stal and *australis* and *albicans* of Walsh. *Rosae* Harris, I think, belongs here.

There are no described species of *Eupteryx* in North America but I am acquainted with several undescribed.

One would expect that several American species would be the same as European but although I have compared our species with the descriptions of the European insects and have had a considerable set of European *typhlocybini* for comparison I have yet to find one identical.

This family is certainly a promising one for study as the literature is small and, therefore, easily obtained and a rich harvest of new species is waiting to reward the student.

NOTES ON CERTAIN CYNIPIDAE WITH DESCRIPTIONS OF NEW SPECIES.

BY C. P. GILLETTE, AMES, IOWA.

(*Concluded from p. 188.*)

NEW SPECIES DESCRIBED.

GALLS ON WHITE OAK (*Quercus alba*).

Andricus foliaformis, n. sp.

Gall. Small wart-like projections thrown out from the mid-rib on the under side of the leaves from which there grows a leafy expanse that extends on all sides like the corolla of a rotate flower. (Fig. 1.)

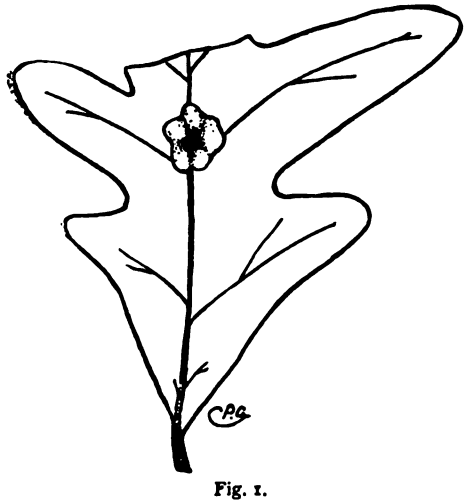

Fig. 1.

Gall-fly: Female. Head, dark reddish brown with median line of face, vertex, and occiput almost black; front and genae with many short gray hairs; vertex bare. Thorax from collar two-thirds of the way to the scutellum, between the parapsidal grooves, black; the remainder of the thorax brown. Parapsidal grooves distinct but not deep; outside of the grooves on either side a longitudinal patch of black is separated from the central black portion by a yellowish-brown line along either groove. Dorsal portion of thorax sparsely haired; pleurae rather densely haired;. tegulae brown. Abdomen brown, smooth and shining, the darkest portion being on the posterior dorsal part. With a power of 50 diameters, minute punctures can be seen on the abdominal segments; second segment sparsely haired on sides. Scutellum with two fovae at base separated from each other by a narrow ridge; rounded behind, black at base, changing to

brown at the tip, and thinly set with long hairs. Head, thorax and abdomen, when examined with a power of 50 diameters, have a scaled appearance. Antennae three-fourths the length of the body, 13-jointed, first and second joints stout, third joint longest, last joint nearly equal to the two preceding in length; slightly clavate and rather densely ciliated throughout; basal joints, yellowish-brown. Length of body, 1.5 mm.

Described from a single specimen that issued 30 July.

Biorhiza rubinus, n. sp.

Galls: When the leaves begin to turn in October, subglobular juicy galls about two or three mm. in diameter and rosy in color are found attached to the under side of the leaves. From a number of these galls collected in October, '87, four were selected and opened 15 October '88, from which one fully developed female cynip and three plump white larvae were obtained.

Gall-fly: Shining black in color except the joints of the legs which are yellowish-brown. Head and thorax appear to be covered with shiny black scales. Clypeus with a number of rather stout hairs; a very few short hairs on front border of epicranium and on occiput; vertex bare. Antennae 13-jointed reaching the middle of the abdomen, first and second joints nearly equal in length and rather stout, the first somewhat stouter than the second, third joint longest and most slender, third to 12th gradually shortened, 13th once and a half as long as the 12th; brown-black in color and covered with a short gray pubescence. Parapsidal grooves are shallow and indistinct, but can be traced about one-third of the way from the scutellum to the collar. Scutellum much rounded behind and with two shallow fovae at base. Abdomen a smooth glossy black. Legs rather thinly set with a gray pubescence; femora with the same scaled appearance as the head and thorax; thorax sparsely set with short gray hairs. Length 1.5 mm.

SWAMP OAK (*Quercus bicolor*).

Holcaspis bassetti, n. sp.

Gall: The gall occurs, sometimes singly, but usually in clusters about the twigs. The cluster represented at Fig 2

Fig. 2.

was composed of 30 of these galls closely

crowded together. The galls resemble very much the galls of *Holcaspis duricoria* Bass. (*Cynips mamma* Wal.) (Fig. 3). The galls are very much the

Fig. 3.

shape that a thick waxy material would take if dropped on the twigs and then suddenly congealed, leaving stout, teat-like projections standing out from each drop. The central cell is placed low in the gall and can usually be seen protruding when the latter is broken off. Some entomologists have thought this gall to be identical with Walsh's *C. mamma*, but I have examined a large number of both forms and the following points of difference, which convince me that this, if not not a new species, is certainly a well marked variety:

H. bassetti as compared with *H. duricoria*, is rather larger and is more irregular in outline. The teat-like projection is much heavier and longer in proportion to the size of the gall and appears to be a drawn-out portion of the substance of the gall, while in *duricoria* it is a small, hard pointed projection much resembling a spine in many cases, and often almost entirely wanting. In *bassetti* the substance of the gall is more corky and easy to cut. The central cell, as before stated, is at the base of the gall, and when the latter is removed the point of the cell can usually be seen protruding below. Before the gall is detached the central cell is situated with its greatest diameter perpendicular to the limb at the point of attachment of the gall. In *duricoria* the cell is situated at the centre of the gall; it never protrudes from below when the gall is detached; and it always has its greatest diameter parallel with the limb at the point of attachment of the gall. The central or larval cells are also differently shaped. In *duricoria* the cell is egg-shaped, while in *bassetti* the end towards the twig is somewhat pointed, so that the cell is very much the shape of a plump apple seed with the point rounded off.

Gall-fly: Female. Median line of the face black, the black portion being broadest between the eyes; vertex dark brown to black; occiput black; orbits and genae cinnamon brown; clypeus and lower border of epicranium black; mandibles black at base and tip, with the median portion brown; palpi a light amber color, with the terminal joints of the maxillary palpi infuscate; and all joints set with gray hairs. The epicra-

nium joining the clypeus is finely rugose. Antennæ 13-jointed; third joint the longest; joints from 3-12 gradually shorter; the 13th equal to the two preceding in length. The terminal joints, under a power of 50 diameters, appear distinctly fluted longitudinally. Color of the antennae black, except the first two joints which are brown-black. All the joints are rather thickly set with a fine pubescense. Parapsidal grooves begin midway on the thorax and extend back to the scutellum. They are very shallow and to the unaided eye appear like two narrow black lines. A little forward of the grooves two parallel black lines arise and extend forward to the collar. Near the base of the wings on either side there begins another black line that runs to the scutellum. In the two latter cases the black lines are narrow, strips of the thorax that have no hairs growing upon them. Scutellum without fovae or grooves, rounded and elevated posteriorly, covered with a yellowish brown pubescense, very irregularly rugose and black in color, except the tip, which is usually brown. Tegulae brown. Abdomen shining black with silky pubescense on the sides of the second segment. Under a power of fifty diameters the sides of the abdominal segments appear crackled or scaled and finely punctate. Wings hyaline; cross veins black and heavy; radial nervure not reaching the costal margin. Length of wing 5.2 to 5.7 mm. Legs very dark cinnamon brown and rather thickly set with a gray pubescense. Terminal joints of tarsi black. Length 4.2 mm.

Described from nine specimens reared from the galls.

Cynips nigricens n. sp.

Galls in clusters attached to the midrib on the under side of the leaves. The galls are cone-shaped, and resemble very small galls of *C. strobilana*. The galls fall to the ground a little before the leaves drop in the fall. From a large number of these galls gathered in October, 1887, I obtained one perfectly developed female late in September, 1888. The fly may be described as follows:

Color, except joints of legs, tarsi, and venter, black.

All parts of the insect except the dorsal portion of the first two or three abdominal segments, and compound eyes, are rather densely and evenly covered with a short gray pubescence set in minute punctures.

Head: vertex and occiput appear to be covered with minute thick scales; clypeus and front rather coarsely punctate. Antennae 13-jointed; first joint stout, third joint longest, third to seventh gradually shorter, eighth to twelfth subequal, thirteenth as long as the two preceding and with a slight indication of a division at its middle. The last five or six joints form a slight club and are fluted longitudinally. Length 2 mm. Thorax: parapsidal grooves distinct but narrow; widely separated at collar, and forming a double curve as they pass over the thorax to the scutellum. Two black parallel lines begin midway on the thorax between the parapsides and

extend to the collar. Another slightly depressed line begins on either side of the thorax near the base of the wings and runs towards the scutellum. Thorax and scutellum with the same scaled appearance as the epicranium. Scutellum broad as long, obtusely rounded posteriorly and with two shallow fovae at base. Wings: areolet small and indistinct; cubital nervure rather faint; cross veins rather heavy; radial nervure not reaching the costal margin. Length, 2 mm. Abdomen: the large second segment occupies about one-third of the abdomen; all of the segments punctured and set with many short gray hairs. Length of insect 3 mm.

BURR OAK (*Quercus macrocarpa*).
Acraspis villosus n. sp.

Gall: Hard globular excrescenses on the under side of the leaves and always attached to the midrib. (Fig. 4) Medium sized specimens measure 5-16 of an inch in diameter. The galls resemble rather closely the galls of *A. erinaceae* but differ from it by having a much heavier pubescense, by always being single-celled and by being light yellow in color.

Fig. 4.

Gall-fly: Sub apterous females only have been reared.

Head: Median line of face, including clypeus, vertex and occiput, black. Orbits and genae dark cinnamon brown. In dark specimens nearly the entire face is black. Jaws and terminal joints of palpi black. Head and mouth parts sparsely pubescent. Epicranium, bordering clypeus, rugose; remainder of head punctate. Thorax, brown, bordered anteriorly and posteriorly with black. Parapsidal grooves wanting. Thorax and scutellum punctate and finely pubescent. Abdomen thickly set with a yellowish-gray pubescence that gives a decided velvety lustre to the sides of the abdomen. The anterior dorsal portion of the second segment has a large bare spot that is continued in a narrow line back over the succeeding segments. The borders of the segments show as black rings crossing the velvety surface. Legs, brown; tarsi infuscate. Antennae 13-jointed; third joint longest; last joint as long as the two preceding, and all of the joints rather densely haired. Length, 4 mm.

Neuroterus nigrum n. sp.

Galls: The galls are little pimples about 2 mm. in diameter on the surface of the leaves (Fig. 5) and show equally well from above and below. There are

usually a large number on a single leaf. The galls appear late in August but the flies do not emerge until the following summer. Few of these galls were noticed in Michigan, but they are very common about Ames, Iowa. My specimens were reared from the leaves of the burr oak, but in a number of instances I have taken galls that seem exactly similar on the leaves of the white oak, *Q. alba*.

Fig. 5.

Gall-fly: Color, except the tarsi, joints of the legs and antennae, black. Head and thorax shining and with a scaled appearance when viewed with a high power. Thorax almost entirely free from hairs and without parapsidal grooves. The meso-thorax is notched posteriorly making it appear as if the scutellum was unifoveate. Scutellum broadly rounded behind; without fovae or grooves; with a very few hairs; and with the same scaly appearance as the head and the thorax. Abdomen, shining black in color, with the ovipositor sheathes projecting. Antennae with the first and second joints very stout and sub-equal in length; third joint longest, and the last four or five joints forming a slight club. The basal joints are sparsely and the terminal joints rather thickly set with short hairs; number of joints, 13. Eyes coarse; ocelli rather obscure. Wings, hyaline; areolet large; radial nervure reaching the costal margin; marginal cell open. Length, 1.3 mm. Length of body, 1 mm.

RED OAK (*Quercus rubra*).

Amphibolips cookii n. sp.

Galls (Fig. 6) globular, with a central larval cell held in place by stout radiating fibers. When green, the galls resemble very much the growing galls of *Amphibolips inanis* O. S. The gall differs from that of *A. inanis* by having a thicker outer shell, by having much stouter radiating fibres, by being somewhat drawn out into a point at either extremity, and by occurring on the buds instead of the leaves. The galls fall with the leaves or before them, and, when dried, the outer surface is much shrivelled in appearance. About a pint of these galls were gathered, some late in the fall and others early in the spring, under a large red oak. On cutting into these galls the first day of September following, five fully developed flies and one pupa were found, all females.

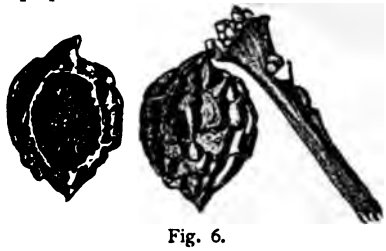

Fig. 6.

Gall-fly: Head small; clypeus and jaws punctate; vertex, occiput, and median line of front coarsely pitted or sculptured; genae and sides of the face deeply rugose, the furrows spreading out like a fan from either side of the clypeus; entire head jet black and rather thinly set with a grayish pubescence, except on the vertex, where it is bare. Jaws black; palpi brown. Antennæ reach the middle of the abdomen; 13-jointed, third joint longest; joints 3-12 gradually shorter; 13th joint next to the third in length and as long as the 11th and 12th together. Thorax entirely black. Parapsidal grooves present but very indistinct and can be traced about one-third of the way from the scutellum to the collar. Between and a little in front of these grooves arise two parallel black ridges that appear as minute shiny lines which extend forward to the collar. Two other similar lines start midway on the thorax a little outside of the parapsidal grooves near the base of the wings and extend back to the scutellum. Thorax and scutellum deeply sculptured and sparsely set with short gray hairs. Scutellum with two large fovae at the base separated by a narrow septum; subquadrangular in outline and rounded and elevated posteriorly. Abdomen varies from a very dark amber to almost black; segments densely and finely punctate when examined with a power of 20 diameters; lateral portions of second segment very sparsely pubescent. Legs dark amber in color except the tips of the tarsi which are black; finely pubescent throughout; coxae black. Wings seven to eight mm. in length; somewhat smoky, and with a large stigmal spot at the base of the marginal cell. Length of body five and one half mm.

The following is a list of the cynipidous galls taken in the vicinity of the Michigan agricultural college. I have in each case given the variety of oak upon which they were taken, the date that the flies emerged, when reared, and the guests and parasites reared from the different species:

Name of gall-fly.	Taken from	Gall taken.	Fly emerged.	Guests.	Parasites.
Diastrophus radicum Bass. . .	Raspberry roots.	May	May 24. . .	. . . . .	. . . . .
Amphibolips coccinea O. S. . .	Q. coccinea leaves	June 14. . .	June 16. . .	. . . . .	. . . . .
Amphibolips cookii n. sp. . . .	Q. rubra buds.	Nov. 10, '87	Sept. 1, '88.	. . . . .	An undetermined species.
Amphibolips inanis O. S. . . .	Q. rubra leaves	June 16. . .	June 21. . .	. . . . .	Torymus sp. Tetrastichus sp.
Amphibolips nubilipennis H. .	Q. rubra leaves	June 20. . .	June 25. . .	. . . . .	An undetermined species.
Amphibolips prunus Walsh. . .	Q. nigrum	Aug. 17 . .	. . . . .	. . . . .	. . . . .
Amphibolips sculpta Bass. . .	Q. rubra leaves	June 18. . .	June 20. . .	. . . . .	Syntomaspis sp.
Amphibolips spongifica O. S. .	Q. rubra leaves	July	Oct. 3 . . .	. . . . .	An undetermined species . . . .
Callirhytis clavula Bass . . .	Q. alba twigs	March . . .	. . . . .	Ceroptes petiolicola O. S. . .	. . . . .
Callirhytis cornigera O. S. . .	Q. ruba twigs.	Nov.	. . . . .	. . . . .	. . . . .
Callirhytis futilis O. S. . . .	Q. alba leaves.	Dec.	. . . . .	. . . . .	. . . . .
Callirhytis punctatus Bass . .	Q. rubra limbs	April . . .	. . . . .	Synergus lignicola O. S. . . Ceroptes petiolicola O. S. .	Decatoma varians Walsh.
Callirhytis scitulus Bass. . . .	Q. rubra twigs	Nov.	. . . . .	. . . . .	An undetermined species.
Callirhytis seminator Harr. . .	Q. alba limbs.	July 5 . . .	July 7 . . .	. . . . .	Syntomaspis sp.
Andricus foliaformis n. sp. . .	Q. alba leaves	July 29 . . .	July 30. . .	. . . . .	. . . . .
Andricus flocci Bass	Q. alba and Q. microcarpa leaves	Dec.	March 5 . .	. . . . .	Tetrastychus sp. Eurytoma sp.
Andricus futilis O. S.	Q. alba leaves	Dec.	. . . . .	. . . . .	. . . . .
Andricus petiolicola Bass. . .	Q. bicolor and Q. macrocarpa leaves	July 3 . . .	July 5 . . .	Ceroptes petiolicola O. S. . .	An undetermined species.
Andricus singularis Bass . . .	Q. rubra leaves	June 5 . . .	June 8 . . .	. . . . .	An undetermined species.
Cynips dimorphus Ash	Q. prinus leaves . . . . Q. bicolor " . . . . Q. macrocarpa leaves. .	Sept. 24 . .	. . . . .	. . . . .	An undetermined species.
Cynips nigricens n. sp.	Q. bicolor leaves	Oct. 10, '87.	Sept. 25, '88	. . . . .	An undetermined species.
Cynips strobilana O. S.	Q. bicolor and Q. macrocarpa twigs	March . . .	. . . . .	Synergus lignicola O. S. . . .	Eurytoma sp.
Acraspis erinaceae Walsh. . .	Q. alba leaves.	Oct. 20 . .	Nov. 5 . . .	. . . . .	Decatoma flavus.
Acraspis villosus n. sp. . . .	Q. macrocarpa leaves . .	Oct. 20 . .	Oct. 29. . .	. . . . .	Eurytoma sp.
Biorhiza forticornis Walsh. . .	Q. alba twigs	Sept. . . .	. . . . .	. . . . .	An undetermined species.
Biorhiza rubinus n. sp. . .	Q. alba leaves.	Oct. 12, '87.	Oct. 15, '88.	. . . . .	. . . . .
Biorhiza macrocarpae Bass . .	Q. macrocarpa leaves . . .	Oct. 1 . . .	Oct. 10. . .	. . . . .	. . . . .
Holcaspis globulus Fitch . . .	Q. alba twigs.	Oct. 15. . .	Oct. 29. . .	. . . . .	Decatoma varians Walsh. Decatoma sp. Eurytoma sp.
Holcaspis duricoria Bass. . . .	Q. macrocarpa and Q. bicolor twigs	Oct. 18. . .	Oct. 23. . .	. . . . .	Orymus ventricosus. Decatoma varians Walsh.
Holcaspis bassetti n. sp	Q. bicolor twigs	Oct. 18. . .	Oct. 31. . .	. . . . .	Orymus ventricosus. Orymus sp. Decatoma varians Walsh.
Holcaspis rugosa Bass	Q. prinus twigs	Oct. 15. . .	Oct. 20. . .	. . . . .	Eurytoma punctiventris Walsh.
Dryophanta papula Bass. . . .	Q. rubra leaves and Q. coccinea leaves . . .	July 8 . . .	July 12. . .	. . . . .	An undetermined species.
Neuroterus nigrum n. sp. . . .	Q. macrocarpa leaves. . .	Oct. 20, '87.	May 10, '88.	. . . . .	An undetermined species.
Neuroterus noxiosus Bass . . .	Q. bicolor twigs	Jan. 3 . . .	March 24. .	Ceroptes petiolicola O. S. . . Synergus sp.	Ceroptes sp. Orymus minutus.
Neuroterus vesicula Bass . . .	Q. bicolor and Q. macrocarpa buds	April 29 . .	May 3 . . .	. . . . .	. . . . .

NOTES ON THE EPIPHARYNX, AND THE EPIPHARYNGEAL ORGANS OF TASTE IN MANDIBULATE INSECTS.

BY ALPHEUS SPRING PACKARD, PROVIDENCE, R. I.

(Concluded from p. 199.)

Order *Platyptera*.

Pteronarcys pupa.—In a specimen from Pagosa, San Juan River, Colorado, the surface of the labrum is provided with stout curved setae which are often forked at the end, like those occurring on the joints of the antennae and caudal stylets. The epipharynx is densely pilose on the edge and over the surface, but there are no sense-cups or rods.

Perla sp.—In a specimen from the Glen, N. H., the labrum is broad and very short, full and rounded, and there is no trace of a median furrow. The epipharynx has a narrow, curved, long, transverse area parallel to and situated near the front edge, on which are two opposing sets of broad-based "gathering" or "hooked" hairs; elsewhere the surface is covered with fine tactile setae, which arise from a cup-shaped base. There is a median furrow free from these setae, and I cannot detect any genuine taste-cups.

In another species from Montana there is the same structure of the epipharynx, which bears at the end a number of tactile setae arising from a cup-shaped base, but there are no true taste-cups.

Psocus novae-scotiae Walk. — Labrum rather large and broad, and somewhat excavated on the front edge. The epipharynx in front is divided into lobes, the front edge of the middle one of which extends a little farther out than the lateral lobes, and has a straight edge. This lobe bears two rows of short setae, those of the distal or marginal row being shorter and consisting of five or six stouter setae, which are blunt at the tip and have the appearance of having been worn off. On the basal half in the middle is a large polygonal pilose area. I cannot detect any sense-cups.

Psocus sp.—In a species from Florida the labrum and epipharynx, with the armature of the latter, are as in the preceding species, and there are no sense-cups to be seen. They seem to be wanting in this genus.

Eutermes ripperti.— In a larval and a winged female from Nassau the labrum and epipharynx have the same shape and armature. The end of the labrum is full and round, with no trace of a median suture. The epipharynx is pilose, with a few long tactile setae. On the front edge is a transverse row of six gustatory (?) setae, each bristle being acute and arising from a beaker-like base. Along each side of the median line on the anterior half of the epipharynx is a group of about 20 scattered

peculiar long depressed tubules ending in a circular membrane, out of which a very short hair projects. These appear to be gustatory. There are also two curved rows of minute cells with a nucleus, three deep, which extend on each side from under the front edge of the clypeus and end near the front edge of the labrum, the two rows converging in front; they are very singular in shape, and towards the front the cells become much elongated and arranged in four or five close ranks. These are probably not sensory cups, but modified surface setae.

Termopsis angusticollis Hagen.—In a female from the Pacific Coast I cannot detect any taste-cups and any organs that appear to be gustatory. The surface of the epipharynx is simply pilose.

Order *Odonata*.

Calopteryx sp.— In a specimen from Florida the armature of the epipharynx is much as in *Diplax*, and there are 25 taste-cups on each side of the median line, but extending farther in front than in *Diplax*.

Diplax sp. — In this as the other dragon flies examined, the labrum is full on the front edge, but there is a fine median suture extending back nearly half way to the base meeting a wide triangular or V-shaped gap. On the anterior edge of the epipharynx is a row of long stiff tactile setae; there is a lateral group of tactile bristles pointing inwards and another smaller group of similar setae in the middle on each side of the median suture, while a few minute hairs extend to the suture.

There is a group of about 14 taste-cups at the base of the labrum on each side of the median line; the central bristle cannot be seen, but as the nucleus is well defined when looked at vertically there is probably one present in each taste-cup. On the outside of each gustatory field are a few inwardly-directed defensive setae. Also outside of each group of taste-cups are near the base of the labrum a group of singular parallel sabre-shaped setae, pointing inwardly and likewise directed towards the base of the labrum.

Aeschna heros Fabr.— Epipharnyx armed with small, short, slender bristles, which along the base (*i.e.*, under the base of the labrum) on each side of the median line become very stout and short. In front of this group of short setae is a pair of short-handled brushes consisting of stiff, coarse setae, one on each side of the median line. In the middle, but situated rather far apart, are two roundish pilose areas. There are two groups of about 25 to 30 taste-cups, like those of *Calopteryx* and *Diplax*, being without a distinct hair and situated as in those genera.

Order *Neuroptera*.

Sialis infumata Newm.—Along the median line of the epipharynx and near the front are about twenty scattered gustatory pegs, which are minute, but longer and more acute than usual. The other setae are large, long and scattered over both sides of the organ.

Chauliodes maculatus Ramb.— The entire surface of the epipharynx is covered with very fine hairs which are broad at the base and very short. There are one or two taste-cups under the front edge of the clypeus; others are scattered along the middle from the base of the labrum to the front, but are not arranged in definite order.

Corydalis cornutus Linn. — The epipharynx of the female is covered with scattered tactile setae, and there are no sense-cups, pits, or rods to be seen.

Chrysopa sp.—In a specimen from Florida the labrum is deeply notched at the end. Over the epipharynx are scattered cups with a short acute bristle, which are probably gustatory in function, though they are not confined to the median region of the epipharynx.

Myrmeleon diversum Hagen.—Labrum very short, with a slight shallow median excavation. As in *Chrysopa*, the presence in the epipharynx of sense-pits or taste-cups is doubtful. What at first seem scattered taste-cups, mostly bear long tactile hairs, which in some cases are very fine and short. But there is a group of pits, probably gustatory, about twelve on each side of the anterior clypeal region, from one to three of them being situated on the base of the labral region; there are also a few on each side near the base of the labral region, some of those in the triangular area near the front edge of the epipharynx may also be gustatory in function. On the whole I am disposed to regard these structures as taste-cups.

Mantispa brunnea Say.—In a specimen from Utah the labrum is rather long and pointed in front, with no traces of a median suture. On the side of the epipharynx are tactile hairs, but along the middle from the base to near the front edge are scattered about 30 unmistakable taste-cups, each bearing a short, fine hair. This confirms me in the belief that the structures above described in *Chrysopa* and in *Myrmeleon* are also gustatory.

Order *Coleoptera*.

I have been unable to detect any sense-organs in the epipharynx of *Dendroctonus rufipennis* Kirby, or of *Lucanus dama* Thunb; on the other hand, taste-cups occur in the larva of cerambycid, scarabaeid and other beetles; but I have been unable to discover any taste-organs in the larva of a rather large elaterid from Florida. Moreover, taste-cups appear to be about as well developed in the carnivorous beetles *Carabidae* as in the phytophagous or lignivorous groups.

Epicauta maculata Say. — Labrum hollowed in front. Epipharynx with unusually numerous taste-cups, which are conical papilliform, and truncated at the end as if open, the edge of the opening is ragged, but no distinct bristle is present, except in a few. Over 100 taste-cups were counted in the middle and near the front; around the edge of the sinus is a regular marginal row of large, longer, more distinctly chitinized taste-cups, whose walls are streaked up and down by chitinous thickenings. It will be seen that in number, structure

and arrangement these organs present excellent and distinctive specific characters.

Epicauta callosa Lec. — In a specimen from Montana, the labrum is notched and on the epipharynx over the region around the bottom of the notch, and from these to the base of the labrum are scattered about 55 taste-cups; and also on either side of a median setose ridge which passes back under the clypeal region are about 10 cells, which may be taste-cups.

Nemognatha lurida Lec. — In a female from Montana a large triangular area extending to and widening out on the front edge of the epipharynx contains about 80 remarkably small taste-cups, not more than $\frac{1}{4}$ to $\frac{1}{6}$ as large as those on the maxillae of the same beetle. Unless these are gustatory it is difficult to account for their presence here and it will be observed that the taste-cups in *Epicauta* are unusually abundant.

Eleodes obsoleta (Say). — In this tenebrionid from Montana, the epipharynx is provided with a group of from 15 to 20 taste-cups on each side in the middle of a squarish area situated in front of the middle, and whose sides are densely setose.

Diabrotica vittata (Fabr.).—In the common striped squash beetle the labrum is suddenly and deeply notched, though there is no trace of a median suture behind the notch. The epipharynx has a singular armature. Just within the bottom of the labral notch on the under side is a row of four, broad, conical setae, whose tips just reach the bottom of the notch. Along the front edge on each side of the notch is a row of most singular broad, flat, thin, leaf-like setae which are closely appressed to the broad, naked, epipharyngeal margin. The surface of the epipharynx is pilose, but the median region is naked, and on the anterior half bears from 11 to 12 taste-cups, arranged each side of the median line in a rude Y. On each side at the base of the labial region are two sensory fields, each bearing about 25 to 26 taste-cups. More were seen under the clypeus.

Leptura canadensis Fabr. — Front edge of the labrum and epipharynx densely fringed with slender, curved, truncated setae. I can see numerous taste-cups under the base of the labrum, and what seems to be scattered taste-cups in front, but the labrum is too opaque for a clear view of them.

Euryptera lateralis Oliv. — In a specimen from Florida the epipharynx is fringed with long, slender, truncate, slightly curved hairs projecting from the front edge. Taste-cups are abundant along and near the middle of the anterior half of the labral region.

Cyllene robiniae Forst. (or *pictus* Drury). — Labrum slightly excavated. Epipharynx with a dense row of long, slender, blunt rods, filling the sinus and extending beyond the edge of the labrum. An area on each side gives rise to very long tactile hairs, between which and the median field of taste-cups is a pilose lateral area. The taste-cups are more numerous than usual, extending in an unbroken sensory field

from near the front margin of the clypeal region to near the front edge of the epipharynx. The cups vary much in size, some being one-half as large as others; and those on the sides of the sensory field bear short, and a few others rather long bristles, showing that the taste-cups are modified tactile bristles.

Lachnosterna fusca Fröhl.—Labrum deeply notched, the sides of the sinus armed with large, blunt setae. Epipharnyx bearing on each side, outside of a spring area, a group of about 50 taste-cups, each bearing a long setae, and passing externally into a few high, rather slender papillae, without a seta. On the under side of the clypeus is a median group of 10 taste-cups of singular form, the cups being large, with broad bases which posteriorly bear three spines, of which the median one is the largest. Behind these organs, the membrane is covered with slender "gathering" hairs, which differ from any previously observed in having a nucleus at the base.

In a specimen from Montana belonging to an allied genus, there is a group of about 30 taste-cups, which occupy the same relative position as in the preceeding species.

In *Lucanus dama*, the entire surface of the epipharynx is pilose, and there are no taste-cups, or sensory organs of any kind present.

Clerus nigripes Say. — Labrum deeply cleft, but with no trace of a median suture. Surface of the epipharynx not pilose, but with scattered defence setae. Near the edge of the bottom of the sinus is a group of 4 or 5 taste-cups, situated on each side of the median line, each bearing a small, acute bristle. Behind these, under the clypeus are two groups of 10 taste-cups each, situated some distance from the median line.

Telephorus rotundicollis Say.—Labrum notched. The epipharynx is quite unlike that of other beetles described, extending quite far in front of the labrum, forming a thin, pale, membranous, pilose edge, and not provided with taste-cups. On each side behind under the clypeus, is a sensory field with 26 taste-cups, which are rather smaller than usual. Over the labral surface are scattered a few taste-cups (?), but they are small and perhaps not gustatory.

Lucidota punctata Lec.—In a Floridan specimen the labrum is narrow, rather long, slightly rounded in front, with no traces of a median suture. Under the clypeus is a group of 12 taste-cups, and in the middle region of the labrum situated in a field extending from near the base to near the front edge are about 40 taste-cups, which, however, are not, as is usual, arranged on each side of the median line. The whole surface is pilose, and the taste-cups instead of being as usual, situated in a bare region, are scattered among the hairs forming the pile.

Buprestis maculiventris Say. — Epipharynx with a few scattered, peculiar, large setae appressed to the surface, and among them are a few minute, sharp, either curved or straight pegs or setae, which may possibly be gustatory,

but no true taste-cups were observed.

Corymbites hieroglyphicus (Say).—Labrum full, slightly notched in front with apparently faint traces of a median suture. Epipharynx pilose, the hairs longest on each side. A few small, scattered taste-cups under the base of the labrum and others scattered along the middle towards the front edge. On each side of the anterior clypeal region is a group of 5 taste-cups.

Campylus denticornis Kirby.—Over the pilose surface of the epipharynx are scattered what may be sensory pits, but they are not situated in a bare area, but among the fine hairs, and these organs may be simply tactile.

Staphylinus violaceus.—In a specimen from Florida, the structure of the labrum is most singular. It is cleft to its base, being divided into two long lobes, with large long setae, and the deep sinus is filled with very long, densely arranged setae. Epipharynx pilose; under the clypeus, on each side near the middle, is a bare rounded area in which are situated 4-5 papilliform taste-cups, and at the base behind them is another linear group of about 7 slenderer, somewhat curved taste-cups.

Dytiscus sp.—In a ♀ Floridan specimen there are on the epipharynx under the clypeus, about 25 taste-cups, which are papilliform, being higher than usual; and on each side under the base of the labrum is a sensory field containing a number of taste-cups.

Harpalus faunus Say.—Epipharynx with a median triangular depression beginning at the base and widening towards and ending on the front edge; this trough is lined with a row of spines, which are shortest towards a point lying under the base of the labrum. Over the bottom of the triangular depression (as it appears under the microscope, but in reality the roof of the area) are scattered shorter spines, and since ganglionated nerves can be traced to each of the spines along the front edge, they are evidently at least tactile setae, and not simply adapted for defence. At the bottom of the furrow are four brushes of bristles, and the posterior surface is covered with very fine, short, "gathering hairs." The taste-cups are situated on a narrow linear field, one on each side, lying half-way between the middle and outer edge of the epipharynx, beginning under the middle of the clypeus and extending only to a point situated under the base of the labrum. The taste-cups themselves are in irregular rows, 50 in all, and in addition there is an aggregation of 9 or 10 cups at the anterior and inner end of the gustatory field. Like the others, these aggregated cups bear each a central, short, conical peg. A bundle of thick nerves can be seen ending each at the base of the cup.

Chlaenius tomentosus (Say).—The epipharynx bears at a point situated under the base of the labrum midway between the median line and the outer edge, a field on which are situated 25 taste-cups. This area extends towards the middle of the labral region. In front of this region, owing to the capacity of the labrum itself, no taste-cups could be detected.

Calosoma calidum (Fabr.). — Labrum very deeply cleft; the sides of the cleft lined with long bristles. There are about 45 taste-cups on each side under the base of the labrum. The cups are papilliform, being rather high, with a seta arising from each.

Cicindela hirticollis Say.—In a Floridan example, the structure of the epipharynx is singular; there are no taste-cups, except a few on two large, round, raised areas, which are guarded in front by a few very long setae. On the surface of each area are numerous very long setae which may if not tactile, have some other sense, as they arise from cup-like bases or cells. Those on the outside are like true taste-cups, with a bristle but little larger than normal in taste-cups generally. I am disposed to regard this sensory field as a highly specialized gustatory aparatus.

VARIATION OF COLOR IN THE LARVAE OF SPHINX GORDIUS.

In September, 1888, we found, in Nonquitt, Mass., feeding on sweet fern (*Comptonia asplenifolia*) and low huckleberry (*Gaylussacia dumosa*) five larvae of peculiar coloring. The head was large, rounded, green, with face-lines of pale yellow-green, edged behind with black. Mouth-parts dark.

The body was 2 inches long, of a very dark olive-green overlaid with deep wine-color, especially on the back. It was *very smooth* in every specimen, and irregularly dotted with white points encircled with black, except the anal shield, which was dotted with black.

There were seven white obliques, shaded above with a little crimson, then edged with *very* dark wine-color.

Caudal horn was black with no side lines.

Anal shield edged with light green.

Spiracles were red lines set in light green spaces, and inconspicuous except the first segment.

Feet red; props of body color, being lighter on the under side.

On June 16th, 1889, one of the pupae formed by these larvae gave *Gordius* ♂.

We can find no mention of such coloring in any of the books to which we have access, and it differs much from that of the ordinary larvae, of which we had fifteen or twenty.

Ida M. Eliot, Caroline G. Soule.

PROCEEDINGS OF SOCIETIES.

COLORADO BIOLOGICAL ASSOCIATION.

REPORT ON ENTOMOLOGY — JAN., FEB., MARCH, 1889. —The membership now numbers 51; the following entomologists have joined during the past three months: Lord Walsingham, Mr. W. S. Foster, Dr. Geo. H: Horn, Mr. J. Jenner Weir, Prof. A. S. Packard, Rev. C. J. S. Bethune, Mr. H: Edwards, and Mr. John T. Carrington.

The additions to the insect-fauna of Colorado, recorded in the books of the association, are as follows: coleoptera, 118 and 2 vars; hymenoptera, 68; orthoptera, 1; rhopalocera, 6 and 3 vars.; heterocera, 76 and 4 vars.; homoptera 5; heteroptera, 5; diptera, 9 and 1 var.; arachnida, 3 and 2 vars. Several of the hymenoptera are undescribed, but will be fully dealt with by Mr. Ashmead, who has in preparation a list of the hymenoptera of Colorado.

Nine reports have been published, containing, among other entomological matter, accounts of the tent caterpillar, the Colorado cabbage flea-beetle (*Phyllotreta pusilla*), the thistle-bud fly (*Scriptotricha culta*), the large flat-headed pine borer (*Chalcophora virginiensis*), and *Euryomia inda*.

The library has been enriched by numerous additions, notices of which have appeared in the weekly reports.

A meeting was held at West Cliff on 29 Jan.: the secretary read a paper on ichneumons.

Owing to the time of year, but little field-work has been done, and our energies have been mostly directed to the identification and classification of specimens captured last year. Mr. Horace G. Smith, Jr., of Denver, has submitted a small but interesting collection of butterflies from Arapahoe co., to Mr. H. W. Nash, and among them he finds a ♂ *Callidryas philea* L, which is new for Colorado, and also an example of *Paphia troglodyta*, and one of *Papilio rutulus*. Mr. W. S. Foster has sent some valuable notes on his captures at Salida and in Marshall Pass, the latter locality being above 10,000 feet. Mr. H. W. Nash sends a note of the occurrence of *Nisoniades alpheus* Edw., in Pueblo co.

Numerous species of insects have been kindly examined and identified by Prof. C. V. Riley, Dr. Geo. H. Horn, Dr. John Hamilton, Prof. A. S. Packard, Mr. W: H. Ashmead, Mr. W: H. Edwards and Lord Walsingham.

T. D. A. Cockerell (Secretary)

PSYCHE,

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CONTENTS:

ADVERTISEMENTS 230
CONTRIBUTION TO A LIST OF THE COLEOPTERA OF THE LOWER PENINSULA OF MICHIGAN.—*Tyler Townsend* 231–235
A SHORT CHAPTER IN THE HISTORY OF THE CYNIPIDOUS GALL-FLIES.—*Homer Franklin Bassett* 235–238
ON A NEW SPECIES OF PEDIOPSIS.—*Edward P. Van Duzee* 238–241
SYNOPSIS OF THE ODONATA OF NORTH AMERICA. No. 1.—*Hermann August Hagen* 241–250
A CONTRIBUTION TOWARDS A KNOWLEDGE OF TERMITES.—*Battista Grassi* . . 250–255
NOTES ON ASILIDAE.—*Samuel Wendell Williston* 255–259
NOTES ON THE EARLY STAGES OF SOME HETEROCERA —*Caroline G. Soule and Ida M. Eliot* 259–269
THE MALE ELEMENT THE ORIGINATING FACTOR IN THE DEVELOPMENT OF SPECIES.—*Jerome McNeill* 269–272
THE STRAWBERRY ROOT LOUSE (Aphis forbesi N. S.)—*Clarence Moores Weed* . 273–274
CLASSIFIED LIST OF FOOD PLANTS OF AMERICAN BUTTERFLIES, DRAWN FROM SCUDDER'S "BUTTERFLIES OF THE EASTERN UNITED STATES" . . . 274–278
PARASITISM OF HIPPODAMIA CONVERGENS.—*C. P. Gillette* 279
EMPHYTUS CINCTUS IN AMERICA.—*John G. Jack* 279
POWER OF VISION IN VESPIDAE.—*Samuel Hubbard Scudder* 279–280
SECOND BROOD OF CALLOSAMIA PROMETHEA.—*Holmes Hinkley* 280
NOTES ON EMESA LONGIPES DEGEER.—*Clarence Moores Weed* 280–281
DESCRIPTION OF THE LARVA OF OSMODERMA SCABRA, BEAUV.—*William Beutenmüller* 281
PROCEEDNGS OF SOCIETIES.—*Cambridge Entomological Club—Colorado Biological Association* 282–284

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CONTRIBUTION TO A LIST OF THE COLEOPTERA OF THE LOWER PENINSULA OF MICHIGAN.

BY TYLER TOWNSEND, WASHINGTON, D. C.

The coleoptera, embracing 161 species, which appear in this list were all, with 9 designated exceptions, collected by the writer in the vicinity of Constantine, Saint Joseph county, Michigan, and form additions to the species given by Hubbard and Schwarz in their "Contribution to a list of the coleoptera of the lower peninsula of Michigan" (Proc. Amer. philos. soc., 1878, v. 17, p. 643-666). The exceptions to the locality of Constantine referred to consist of 9 species which have been recorded elsewhere in the lower peninsula but are not included in the H. & S. list; and the localities of these, whether general or special, are appended, the authorities for the same appearing after them in brackets.

For aid in the matter of determinations the writer is indebted to Dr. C. V. Riley, Mr. E. A. Schwarz of the Department of agriculture, and Mr. M. L. Linell of the National museum; also to Dr. G. H. Horn of Philadelphia, who kindly determined a portion of the species several years ago. A very large number of the coleoptera recorded by Hubbard and Schwarz as occurring in the lower peninsula of Michigan, have been locally verified by being collected in Saint Joseph county, but are omitted from publication, as this simple additional list will prove much more useful. The species mentioned here, as well as all those collected in this locality, now form a part of the National museum collection.

In several genera, notably of *staphylinidae*, unnamed species have been collected, but those belonging to genera represented in the H. & S. list are not inserted, unnamed species being designated only in such genera as have not been recorded for the fauna.

CICINDELIDAE.

Cicindela 6-guttata F. var. patruela Dej.
punctulata F.

CARABIDAE.

Blethisa quadricollis Hald.
Pasimachus elongatus Lec.
Myas coracinus Say.
Diplochila impressicollis Dej.
Platynus tenuis Lec.
Galerita lecontei Dej.
Helluomorpha bicolor Harr.

Brachynus minutus Harr.
perplexus Dej.
? lateralis Dej.
Chlaenius ? laticollis Say.
nemoralis Say.
circumcinctus Say.
Brachylobus lithophilus Say.

DYTISCIDAE.

Agabus taeniolatus Harr.
Dytiscus verticalis Say.

HYDROPHILIDAE.

Helophorus lacustris Lec.
Hydrobius tessellatus Ziegl.

SILPHIDAE.

Necrophorus guttula Mots.

STAPHYLINIDAE.

Homalota plana Gyll.
festinans Er.
elevata Fauv.
Callicerus n. sp.
Aleochara bimaculata Grav.
Haploglossa n. sp.
Microglossa suturalis Mann.
Oxypoda minuta Sachse.
Silusa n. sp.
Philonthus umbrinus Grav.
varians Payk.
longicornis Steph.
sordidus Grav.
microphthalmus Horn.
Stenus arculus Er.
Lathrobium anale Lec.
Boletobius exoletus Er.
Homalium humerosum Fauv.

COCCINELLIDAE.

Hippodamia glacialis F.
convergens Guér.
Adalia frigida Schn.
Brachyacantha ursina F. (large form.)

EROTYLIDAE.

Languria bicolor F.

CUCUJIDAE.

Laemophlaeus modestus Say.
punctatus Lec.
pusillus Sch.

DERMESTIDAE.

Dermestes pulcher Lec.
Trogoderma ornatum Say.

HISTERIDAE.

Hister vernus Say.

NITIDULIDAE.

Carpophilus corticinus Er.
Epuraea aestiva L.
Rhizophagus bipunctatus Say.

LATRIDIIDAE.

Corticaria villosa Zimm.

TROGOSITIDAE.

Tenebrioides castanea Melsh. var. laticollis Horn.
Bactridium striolatum Reit.

PARNIDAE.

Dryops fastigiatus Say.
Macronychus glabratus Say.

DASCYLLIDAE.

Scirtes orbiculatus F.
Cyphon variabilis Thunb. (yellow form.)

ELATERIDAE.

Adelocera brevicornis Lec.
Cardiophorus gagates Er.
tenebrosus Lec.
Elater manipularis Cand.
Melanotus macer Lec.
paganus Cand.

BUPRESTIDAE.

Chalcophora liberta Germ. Mich. [Cook.]
Agrilus otiosus Say.
Brachys aeruginosa Gory.

LAMPYRIDAE.

Calopteron ? terminale Say.
Plateros canaliculatus Say.
Telephorus marginellus Lec.

CLERIDAE.

Cymatodera brunnea Melsh.
bicolor Say.
Chariessa pilosa Forst.

PTINIDAE.

Amphicerus bicaudatus Say. Mich. [Cook.]
Dinoderus ? densus Lec.
Lyctus striatus Melsh.

CIOIDAE.

Cis chevrolatii Mellié.

SCARABAEIDAE.

Canthon laevis Drury.
Phanaeus carnifex L.
Geotrupes opacus Hald.
Trox suberosus F.
erinaceus Lec.
terrestris Say.
Lachnosterna prunina Lec.
Anomala binotata Gyll.
undulata Melsh.
Chalepus trachypygus Burm.
Euphoria sepulchralis F.
Osmoderma eremicola Knoch.
Valgus canaliculatus F.
squamiger Beauv.

CERAMBYCIDAE.

Phymatodes amoenus Say.
dimidiatus Kirby.
Romaleum atomarium Drury.
Elaphidion mucronatum F.
Plagionotus speciosus Say. Mich [Cook.]
Rhagium lineatum Oliv. Pine regions. [Cook.]
Strangalia famelica Newm.
luteicornis F.
bicolor Swed.
Typocerus lugubris Say.
sinuatus Newm.
Leptura exigua Newm.
canadensis F.
Monohammus titillator F. Pine regions. [Cook.]
Goes pulchra Hald.
pulverulenta Hald.
Hyperplatys aspersus Say.
Saperda candida F. Mich. [Cook.]
Tetraopes quinquemaculatus Hald.

CHRYSOMELIDAE.

Donacia emarginata Kirby.
cuprea Kirby.
flavipes Kirby.
Lema collaris Say.
Anomoea laticlavia Forst.
Coscinoptera dominicana F.
Exema gibber Oliv.
Bassareus mammifer Newm. var. luteipennis Melsh.
Cryptocephalus insertus Hald.
Pachybrachys othonus Say. var. carbonarius Hald.
luridus F.
id. (black form.)
Diachus auratus F.
Glyptoscelis pubescens F.
Paria 6-notata Say. (black form.)
aterrima Oliv.
id. (black form.)
Lina lapponica L.
Adimonia externa Say.
Galeruca integra Lec.
Oedionychis scalaris Melsh. var.
Disonycha punctigera Lec.
pennsylvanica Ill.
Haltica chalybea Ill.
ignita Ill.
inaerata Lec.
Systena hudsonias Forst.

BRUCHIDAE.

Spermophagus robiniae Sch.
Bruchus nigrinus Horn.

TENEBRIONIDAE.

Xylopinus aenescens Lec.
Blapstinus metallicus F.
Uloma imberbis Lec.

CISTELIDAE.

Mycetochares bicolor Coup.

MELANDRYIDAE.

Tetratoma truncorum Lec.

MORDELLIDAE.

Mordella octopunctata F.

ANTHICIDAE.

Corphyra collaris Say.
Notoxus monodon F. (black form.)

MELOIDAE.

Nemognatha piezata F.

RHIPIPHORIDAE.

Rhipiphorus pectinatus F.

RHYNCHITIDAE.

Rhynchites bicolor F.

ATTELABIDAE.

Attelabus bipustulatus F.

OTIORHYNCHIDAE.

Otiorhynchus ovatus L.

CURCULIONIDAE.

Apion herculanum Smith.
Listronotus squamiger Say.
Lixus terminalis Lec.
Ceutorhynchus septentrionalis Gyll.
Baris umbilicata Lec.
Centrinus capillatus Lec.

CALANDRIDAE.

Calandra remotepunctata Gyll.
Cossonus platalea Say.

SCOLYTIDAE.

Pityophthorus pullus Zimm.
Coccotrypes jalappae Letz. Detroit. [Schwarz.]
Tomicus calligraphus Germ. Pine regions. [Cook.]
Dendroctonus terebrans Oliv. Pine regions. [Cook.]

A SHORT CHAPTER IN THE HISTORY OF THE CYNIPIDOUS GALL-FLIES.

BY HOMER FRANKLIN BASSETT, WATERBURY, CT.

It was reasonable to suppose that when that most interesting field of research into the life history of the gall insects that relates to their agamic reproduction had been opened, some one or more of our young entomologists would have entered upon the investigations that were necessary, and long ago, have done for our American what the German and French entomologists have done for the European species.

The writer, who so long ago as 1864, published the first clue to the solution of the mystery of agamic reproduction in the family of the *cynipidae*, has, unfortunately, grown old without finding the leisure to follow, very far, the fascinating field for discovery that then appeared before him.

I have, since then, done some fragmentary work in the way of describing new species, and some work that I do not yet despair of giving to the world in the shape of a monograph of the *cynipidae*, but the limited leisure I have had and the uncertainty of being able to follow to results, any investigations or observations that demanded attention at a definite time and place, has debarred me from following what I still think, one of the most interesting and important branches of entomological study.

I have gathered a few facts, however, and I beg to lay before the readers of PSYCHE an account of a discovery I made this last spring, partly in the hope that it may lead some one to go further in the same line,—but chiefly, because every discovery in science belongs to the world just as soon as its validity is established.

One of our most common gall insects here in Connecticut is *Callirhytis futilis*, O. S. The galls appear in early summer, in great numbers on the leaves of *Quercus alba*. They are in the form of conical blotches, projecting from both surfaces of the leaf, but are more prom-

inent on the upper surface, and are about one-fourth of an inch in diameter. Each gall produces three of four small gall-flies that emerge about the first of July, copulating immediately and then disappearing. Where they went nobody knew, or seemed to know till I found out their secret last spring.

Before the leaves appeared I visited a thicket of young oaks where I had found these galls very abundant in past years, hoping to find their progenitor—whoever she might be—ovipositing in the buds of these oaks—but I was too early; she had not begun her work. But where was she napping at the time? This question was not by any means a new one to me.

The soft, sandy loam at the roots of a clump of oak bushes,—softer because of the effects of the frost that had but recently left it,—yielded to my fingers and I soon had one of the main roots laid bare. Judge of the joyful surprise it gave me to find the bark of this root a solid mass of blister like swellings.

Removing a portion of it with my knife I found it literally full of minute larvae, each imbedded in a mass of living vegetable pulp, but so very small and immature were these larvae that I was certain that they could not arrive at maturity in season for egg-laying in the then swelling buds.

I uncovered other roots of this and other clumps of oaks, always finding more or less of the larvae in the bark, and at length, in some older blisters, I found well grown cynipidous larvae, evidently a year older than those first found, but still their maturity seemed too far off for the work to be done within the next few days.

I collected on that and several close succeeding days a quantity of bark containing larvae, and, placing it in sand, and in a glass case, found after three or four days that several perfect gall-flies had come out. Within a week or so quite a number appeared, but the bark deprived of the sap of the tree, no longer furnished food for the young larvae and they died.

That nature, provident against the extinction of her children, in this case, keeps two generations in the larval state at the same time seems absolutely certain, and I feel nearly sure there are really three; that the larger larvae noticed will not appear until next spring, and that the perfect insects were in that state at the time I first found the galls.

But I am asked: How do you know that these root gall-flies are the producers of the *futilis* galls? Perhaps I cannot convince the querist, but the proof I have to offer is as follows:

Suffering in health from too close confinement in my place of business during the winter, as soon as the weather would permit, I spent a part of nearly every pleasant day in the open air. I improved these hours in watching my pets in the woods and thickets. I found hundreds of gall-flies ovipositing in the buds of oaks of various species, flies of several species, and one of these I found abundant on the low white oak bushes. I captured many of them but left unmolested far more than I cap

tured, marking the trees and the very twigs on which they were at work. Waiting till the leaves were fully grown I found these oaks bore *futilis* galls in abundance, but no other species, and comparing the flies I captured with those I got from the bark galls found them to be identical. Of their identity there can be no doubt whatever.

But I am asked: Do they agree in character with the flies from the *futilis* galls? They do not; and they would, no doubt, be described as a different species. They are many times larger than the *futilis* flies, and there are other points of difference. But this variation was to be looked for, developed, as the two generations are, under conditions so widely different.

Dr. Adler and other European entomologists, who have followed the life history of these insects more closely than I have been able to do, have found that the two generations differ so widely that they have been classed, by those who were not aware of their close relationship, not only as two different species, but have actually been placed in different genera.

I name and describe this insect as follows:

Callirhytis radicis, Bass. (agamous form of *N. futilis*, O. S.) Head black and opaque, face, cheeks and vertex with short, bristle-like hairs. Antennae very short, with fourteen distinct joints; the first joint short and thick, the second globular (scarcely ovate); length of the third one-fourth less than that of the two preceeding, the diameter of each from the eighth to the fourteenth inclusive equals their length; the last forms a very blunt cone. Color of the antennae dark reddish brown, changing gradually to a dull dusky brown towards the apex.

Thorax black, the punctuation fine and beautifully regular and even. Parapsidal grooves extending throughout, broad, shining lines over the base of the wings, a narrow but distinct median line from the collare to the scutellum and two parallel lines, one each side or the median line and in close proximity to it, reaching half way from the collare to the scutellum.

Scutellum coarsely and irregularly wrinkled, the fovae round, deep and shining.

Abdomen large, black with brown translucent edges; second segment very long and with a dense band of yellowish white hairs on the anterior margin, the third segment mostly, and the remaining ones quite concealed.

Legs: trochanter black, the remaining joints very dark cinnamon brown. Claws black, simple. Wings large, hyaline; principal veins pale brown, others colorless; radial area broad, the angle of the first transverse vein projecting sharply into the basal portion; areolet very small and the lateral veins bounding it entirely colorless.

Length: body, .15; antennae, 09; wings, .16.

Those taken in the act of ovipositing are in all respects like those described except that the color of the antennae, legs and wings is a trifle darker,—owing.

no doubt, to the fact that these were exposed to the sunlight while the others were not.

Females reared from *futilis* galls this season are .10 in length; the wings .10 and the antennæ .07 with thirteen joints only, with a partial suture on one side of the terminal joint.

The median line on the thorax entirely wanting; the head less hairy but with a few scattered hairs on the thorax and on the sides of the second abdominal segment. The wing-veins are a darker brown.

The galls are blister-like swellings in the smooth bark of the roots of young white oak trees, completely covering the root in some cases for the distance of two feet or more from the tree.

NOTE.—A later examination of these insects in a strong light shows that the head and abdomen are really a very dark reddish brown. In ordinary reflected light they are easily taken for black.

ON A NEW SPECIES OF PEDIOPSIS.

BY EDWARD P. VAN DUZEE, BUFFALO, N. Y.

To the kindness of Mr. D. W. Coquillett of Los Angeles, California, I am indebted for the opportunity of examining a very interesting lot of *Jassidae* from that locality. Among this material is one insect that deserves special notice. It is a species of *Pediopsis* closely allied to the eastern *viridis*, and still more closely to the European *virescens*. The colors are probably somewhat faded, and possibly altered by an alcoholic bath, but this will scarcely affect the determination of the species. It may be characterized as follows:

PEDIOPSIS OCCIDENTALIS n. sp.

Female.—Form of *P. viridis*, broader and more robust than *P. virescens*. Color dull greenish yellow, uniform; propleura with a black spot; antennal seta brown. Length about 5 mm.

Face as in *virescens*, more distinctly punctured than in *viridis;* front broader below at the base of the clypeus, which is proportionately narrower, and the lorae are much more tumid than in that species or *virescens;* the clypeus is broadly depressed entirely across the apex, while in *viridis* this depression is confined to the narrow submargin on either side before the lora, and is scarcely more extended than in the European species. Antennae pale at base, setae brownish. Pronotum shorter and broader than in either of the allied species; the rugae are less distinct than in *virescens*, but more so than in *viridis*. Propleura with a black spot. Ventral plate as in *virescens*, shorter and broader toward the apex than in *viridis*, the tip emarginate, and the sides distinctly con-

vex, not concave as in our eastern species. In other characters it does not seem to differ from its allies.

Male.—Very similar to *P. viridis;* dull grey- or greenish-brown; elytra subhyaline fulvous-brown; beneath paler; propleura with a black spot. Length about 4 mm.

Face rugosely punctured above, front with shallow punctures; lorae narrow, tumid. Apex of the clypeus narrowly depressed. Antennae pale brown, setae darker, claws brown. Abdomen tinged with rufous. This form hardly differs from the brown males of *viridis;* the pronotum is somewhat more rounded before, the general color is a more uniform greyish-brown, and there is no indication of the dark shade on the basal angles of the scutellum so generally found in the male *viridis.*

California. Described from two females and three males. Nos. 602 ♂ and 603 ♀. Coquillett.

The existence of this species on the Pacific coast suggests a very interesting line of conjecture to which I wish to draw attention here. In *Pediopsis* we find three species of a uniform green color and closely allied structurally but still separable by characters apparently constant, viz: *virescens* ranging over the whole of Europe and Great Britian; *viridis* occupying the whole of North America east of the Rocky Mountains and extending its range southward at least to the southern boundary of the United States; and *occidentalis* with an unknown range on the Pacific coast. The differences between these species have been indicated above. A careful review of these will show that the Californian species is very close to the European while our eastern form differs more widely from both; still in some characters *occidentalis* approaches much nearer to *viridis* than to *virescens*, such as the form and sculpturation of the pronotum, and the general proportions of the whole insect; the form of the clypeus and ventral plate agree very closely with *virescens* and seem to ally the insect most closely with that species. Thus far the females. Of the males I cannot speak as positively; the brown forms occurring with *viridis* and *occidentalis* I have assumed to be the males of these species. In the case of *viridis* I have all but positive proof, but in *occidentalis* analogy has been my only guide. If my assignment of the males is correct we have in *virescens* only green males (I can find no record of a brown form), in *viridis* both green and brown forms, the latter by far the more abundant in New York, and in *occidentalis* only brown males as far as known. The brown males of our American species are scarcely separable, but a few characters seem to be available for this purpose; possibly these brown males are melanic forms dependant on atmospheric conditions for their appearance.

A question naturally suggested by a comparison of these closely allied species is: Where did they originate and how are they related? For an explanation at all satisfactory we must go back to a time before the glacial epoch when doubtless the parent form occupied a

broad territory in the high northern latitudes extending its range more or less over the north of both hemispheres. With the southern advance of the polar ice-sheet this insect was driven far to the south where the oceans and meridional mountain ranges divided the original form into at least three distinct families, which, isolated from each other, and under the influence of different environments, have been modified and become fixed into the species as we now find them. It would but poorly satisfy the conditions of the case to suppose that either form, as at present distinguished, has, after being introduced into the other faunal regions, become modified to the extent we find here.

Therefore we doubtless have here three species of equal value and of the same age, although not equally differentiated from one another. The similarity of the climatic conditions surrounding the European and Californian families would naturally produce, as we find to be the case, species more closely related to each other than to the eastern American family, surrounded as it was by greater climatic variations and occupying probably a much larger area. This view of the origin of these little green pediopsids is in full accord with the views of Mr. A. R. Grote. in regard to the origin of the North American lepidopterous fauna, expressed in v. 1 of the *Bulletin of the Buffalo society of natural sciences*, p. 200 and more fully developed in 1884 in v. 18 of the *Canadian entomologist.*

Some portions of the North American homopterous fauua very closely parallel the corresponding European faunas but I apprehend that but few species—such as have been recently introduced, and possibly a few others—will prove to be actually identical with the European forms. These many allied species, suggesting so strongly a common origin, belong to distinctively northern groups that show as marked a parallelism in genera as in species, and seem to be decendants of a tertiary fauna common to the northern parts of both hemispheres, which in adjusting themselves to the conditions imposed on them by glacial action have been modified, some more, some less, but few so little that they can now be declared identical. A comparison of the European and American lists of *Jassidae* will show a very large percentage of northern European genera represented in boreal America. A few peculiar groups of course appear, but when our western hemiptera are better known this general statement will, I am convinced, find strong additional verification.

Of the species of hemiptera common to both sides of the Atlantic some appear to have undergone no change, such are *Cymus claviculus*, *Scolopostethus affinis*, *Leptopterna dolobrata*, *Opsiocoetus personatus*, *Cicadula 6-notatus* etc. Others while practically identical, exhibit modifications of structure or marking, or tend to produce varieties not strictly paralleled in the European facies of the species, e. g. *Hebrus pusillus*, *Philaenus spumarius*, *Athysanus striola*, and possibly *Lygus prat-*

ensis. Still others, while but little more widely differentiated are considered as distinct species; there are many of these but a few will answer for illustration, *Eurygaster alternatus* and *E. maurus*, *Neottiglossa undata* and *N. inflexa*, *Triphleps insidiosus* and *T. niger*, *Cixius pini* and *C. stigmaticus*, and *Deltocephalus debilis* and *D. abdominalis*. The first series may probably have been introduced from one faunal region to another, but the two latter series naturally lead us to look back to a common preglacial ancestor whose descendants in the second series have, in accomodating themselves to their changing environments, undergone a similar modification in the different regions, or have exhibited greater stability in resisting these changes. In the third series the change has been a little—sometimes only a very little—more perceptable.

In *Psyche* v. 5. p. 211-214, Mr. C. W. Woodworth, in an interesting and instructive paper on the genera of the North American typhlocybini, says he has not recognized a single European species of the group from this country; he seems to have been unaware of the fact that *Kybos smaragdulus* occurs not only throughout the northern states and Canada but even as far west as California from whence I have recently received examples from Mr. Coquillett.

SYNOPSIS OF THE ODONATA OF NORTH AMERICA. No. 1.

BY HERMANN AUGUST HAGEN, CAMBRIDGE, MASS.

Since 1861, when my Synopsis was published by the Smithsonian Institution, I have, of course, studied these Odonata. The specimens described in my first work were never less than three years old, mostly over twenty, some nearly sixty. During my residence here I have always tried to compare fresh specimens, and if possible to describe living ones. There are very few of which the old types could not be studied again with new specimens. Of the species described since 1861 I have seen the types or had sufficient information by the authors themselves. The localities are given here always as complete and detailed as possible.

Tribe I. Agrionina.

Eyes distant; antennae four-jointed; wings equal; abdomen cylindrical, slender; accessory male-genitals with the anterior hamulus connate; penis and vesicula separated; female genitals vaginate.

Sub-family. Calopterygina.

Antecubital veins numerous.

Calopteryx Leach.

Wings broad, densely reticulated; pterostigma absent in the male; in the female absent, or very small, or irregular, areolate; basal space without transverse veins; quadrangular space

straight; legs long, densely spinose; appendages of the male forcipate, of the same shape in all species.

I have given a preliminary notice on the previous stages, Compt. rend. soc. ent. Belge., 1880, May 1; the figures are not yet published.

Larvae slender, elongate; the basal joint of the antennae very strong and twice as long as the other six together; mask elongate, narrow, very dilated on tip, split *en losange* far beyond the base of the palpi; occiput on each side with a prominent spine; legs long, slender, abdomen on tip with three flat pointed gills, the intermediate shorter; there are rectal gills, and stigmata as commonly.

The genus *Calopteryx* largely represented in the northern boreal and temperate zone nowhere passes to the south beyond the 30th degree. The excellent study of De Selys has shown that the species are few, but the varieties and races rather numerous. For the old world three species: *C. virgo*, *C. splendens* and *C. haemorhoidalis* live in Europe and on the northern border of Africa. The first two are to be found also in the northern and western parts of Asia. For the eastern part of Asia and Japan, three species are known, *C. atrata*, *C. cornelia* and *C. grandaeva*. None of these species are found in the new world. De Selys (Odonates de l'Asie mineure, 1887. Ann. soc. entom. Belg.) has given a splendid study of *Calopteryx*. The important race *Corientalis* Selys, p. 40, he considers as proving that *C. syriaca* is a race of *C. splendens*, the more so as some large males Synop. 3 Add., p 7. seem to support this opinion. He was sorry to have seen only the male. Mr. E. Eichwald (Reise auf dem kaspischen meere, 1837, v. 2, p. 272) has described the female. In Lakwish Mingrelia he saw many Odonata metallic blue and metallic green. He believed the latter to be a new species, *Agrion colchicius* (sic!) aeneo viridis, thorace altiore, sulcis inter areas aeneo-virides nigris notato, inferne nebuloso-coerulea, trunco superne aeneo-viridi, ultimis segmentis minimis tumidioribus, flavidis; alis omnibus aequalibus, medio posticis dilatatis, apicibus rotundatis, aenea viridi-nigrescentibus, omnibus antice macula marginali nivea notatis; pedibus nigris, subtus nebuloso-coeruleis, antice longis setis piliformibus instructis; venis alarum parvis (cf Stettin. ent. zeitung, 1856, p. 365).

GROUP 1. Wings narrow; the hind margin parallel to the front margin. (*Sylphis* Hagen.)

1. CALOPTERYX ANGUSTIPENNIS.

Sylphis angustipennis, male. Selys Monogr. Cal. 21,2; Synops. Cal. 9,2; 4 Add. 6,1. — Walker Catal. Br. mus. 590,2 — Hagen Syn. Neur. N. A. 56,1; Stett. ent. zeitung, v. 24, 372,24. Proc. Bost. soc. nat. hist. v. 16, 363,51 (the two last on Abbot's figure); Syn. Odon. N. A. 20,1 — McLachlan Ent. mo. mag. v. 10, 227 female, Abbot's type.

Sylphis elegans, female. Selys Monogr. Cal. 20,1; pl. 2, f. 1; Synops.

Cal. 9,1; Walker Catal. Br. mus. 590,1.

Male (adult ?); known only by short diagnosis made in 1851 by De Selys and by Abbot's figure, both compared by myself and declared to be similar to the female described as *S. elegans*. Brassy green, labrum and labium and the second joint of the antennae pale yellow, two sharp tubercles behind the occiput; legs very long, spines short, black; appendages similar to *C. virgo*; wings very narrow, pointed, the hind wings eight mm. broad; hyaline, pale greenish, probably also the reticulation; sector principal partly connected with the mediana; 29 antecubitals.

Female, semi-adult; metallic green; labium pale, labrum pale yellow, a little black in the middle of the margin; epistoma metallic green in the middle; sides of the mouth pale yellow head metallic green above, with a yellow spot before the ocelli; second and third joint yellow, of nearly equal length; tubercle on the occiput sharp; colors of the thorax not finished: dorsum metallic green in the middle, reddish-brown to the humeral suture, which is fine and yellow; mesothoracic crista black: sides metallic blue between two lateral yellow bands: below and around the legs yellow: axillary callus steel-blue: legs brown, darker to the knees, thin and very long, the hind legs 26 mm. reaching nearly to the end of the fifth abdominal segment; spines shorter and not so frequent as commonly; wings long, a little pointed on tip, narrow: front wings, 7½ mm. broad on the nodus: hind wings 6½ mm. a little yellowish; reticulation pale reddish; costa steel-blue; 30 antecubitals; 8 in quadrangular space; sector principal very near to the mediana, but not entirely connected; everywhere only one series of cells between two veins; no pterostigma; abdomen metallic green, below blackish; only the five basal segments retained.

Female, adult. Brassy green, shining; labium yellow, blackish in middle; labrum yellow; middle of front-margin finely black, also an impressed basal spot; head and epistoma brassy green; second joint of antenna yellow; thorax brassy green; crista black; humeral suture finely yellow; sides brassy green after the second suture, between the legs, and below dull yellowish; legs black; wings long, a little broader, front wings 9 mm., hind wings 8 mm. broad near the nodus; apex more rounded; a little yellowish, more colored at the base; reticulation black; costa and axillary callus brassy green; 25 antecubitals; 6 to 5 in quadrangular space; sector principal entirely connected with mediana shortly after its origin; no pterostigma; abdomen brassy green, black below: last segments darker brassy, with a white longitudinal band on the three apical ones, broader on the penultimate, smaller on the segment before and on the last, ending on the apical carina; appendages yellow, sharp; sides of last segments and valves yellow, with black palpus.

	Male.	*Female.*	*Female, adult.*
Length,	67	52	56
Abdomen,	56	43	43
Exp. al..	32	78	78

HAB. Briar Creek, Georgia, rare, April 18, Abbot; male type in the Brit. mus. (figured); female Dublin Mus. r. soc. (not seen by me); female type of *S. elegans* out of Berlin mus., bought by me, 1835, with the label written by Count Hoffmansegg, "patria ignota." There was in 1845 no other specimen in the Berlin mus. Female adult Bee Spring, Kentucky, June, by Frank G. Sanborn; both females now in the Cambridge (mus.).

The insufficient material leaves this species doubtful. De Selys and myself have studied the male type in the British museum, and McLachlan the female in Dublin, which he declares to belong to *C. angustipennis*. The female of *S. elegans* is rather young. The character formerly urged by De Selys that the principal sector is connected with the mediana in *S. angustipennis*, and separated in *S. elegans* has been recognized as not so striking. The male type shows the sector very near but separated from the mediana; but male and female are probably both young specimens. The female adult from Kentucky has the sector principal connected with the mediana. This female has the wings a little broader. The difference of this female from *C. amata* is shown by the lack of the pterostigma, by the yellow appendages, black in *C. amata*, and the white band on the last three segments. The differences of the female *S. elegans* may be considered as belonging to its younger age. With our actual knowledge of *Calopteryx* of the whole world there is no doubt that *S. elegans* is a North American species.

2. CALOPTERYX AMATA Hagen, nov. spec.

Male, brassy blue; head bronze, brassy green near occiput, which has on each side a sharp tubercle; epistoma bronze; second joint of antenna yellow; labrum yellow, a basal spot and margin around black; labium yellow, middle part black; thorax brassy blue; dorsal crista black, sides brassy green; around the coxae yellow; a small band below on the first suture and another along the ventral border yellow; legs long, black; hind tibia 11 mm.; abdomen brassy blue, below black; appendages of the typical shape, black; the inferiors below at the base reddish; wings narrow, 9 mm. broad at the nodus, with a yellowish tinge, stronger at the base; costa and axillary callus steel-blue, reticulation black, not very dense; no pterostigma; hind wings brown on the tip for the fourth part of their length, the internal border of the brown straight but not well defined; the tip of the brown spot sometimes brighter; antecubitals about 30; in the quadrangular space 3 to 5.

Female, brassy green; head similar but the yellow labium only with a triangular black basal spot, ending on the beginning of the split; thorax brassy green; dorsal crista black, the humeral suture fine yellow; the yellow color below and around the legs more advanced; the band on the first suture longer; the ventral band broader; legs as in the male; abdomen brassy green, black be-

low; last segments darker brassy, with a broad, dorsal, yellowish white, median band on the penultimate segment, and a narrower one on the last, which ends on the sharp apical carina; appendages black, sharp; sides of last segments and valves yellow, with a black palpus; wings similar, with a more yellowish tinge; a very small yellow pterostigma, a little dilated in middle, variable in size, covering two to five cells, sometimes with transversal; between one and two mm. long, or less.

	Male	*Female*
Length,	55	48
Abdomen,	45	38
Exp. al.,	75	75

HAB. Dublin, New Hampshire, near Thorndike pond, 1300 ft. above sea level, 2 females, June 18, 1887, and 4 males and 2 females June 22, 1889, by Mr. Louis Cabot.

The hind wings with brown apical color, and the yellow pterostigma of all females are good characters for *C. amata*.

3. CALOPTERYX DIMIDIATA.

Calopteryx dimidiata Burm. Handb. v. 2, 826,16 fem. Selys Monogr. Cal. 24,4. — Syn. Cal. 10,4. — Walker, Catal. Br. mus. 591,4. — Hagen, Syn. Neur. N. A. 56,1; Stett. ent. zeitung, v. 24, 272,25; Proc. Bost. soc. nat. hist. v. 16, 364,52 (both on Abbot's figure).

Calopteryx cognata Ramb. Neur. 222,6 female.

Calopteryx syriaca Ramb. Neur. 223,9 note, male.

Male, metallic blue, on thorax and end of abdomen changing partly to green; labium, head below and antennae black; labrum and epistoma metallic blue, shining; tubercle on occiput sharp; crista of the thorax, all sutures and below black; legs black; abdomen black below; appendages of the typical shape, black; wings narrow, hyaline with light yellowish tinge, the apical part black, with the inner border of the black straight; reticulation black, costa steel blue; front wings 22 to 27 antecubitals; in the quadrangular space 6 to 8.

Female adult, metallic green, head and prothorax sometimes changing to blue; colors as on the male; thorax more evident in younger specimens with the second suture and the ventral border and below yellowish; legs and the more numerous spines black; hind legs reaching to the beginning of the fourth segment; abdomen very slender, metallic green, last segment dark; below entirely black, appendages black; the lateral border below the appendages with 4 to 5 small teeth; wings hyaline, very slightly yellowish; apex of hind wings brown in the last quarter, the inner margin straight; apex of front wings brownish, not so well defined; pterostigma large, white, dilated in middle, crossed by some transversals; reticulation black; the costa and axillary callus steel blue; the sinus before the wing-base with the posterior border straight; 20 to 25 antecubitals; quadrangular space 4 to 6 transversals.

The young females have the wings hyaline, with a little yellowish tinge, not brown on tips, except a light

brownish shade on hind wings.

	Male	*Female*
Length,	50	38–45
Abdomen,	38	31–38
Alar. exp.,	58	57-64

HAB. Kentucky, Burmeister's type; Georgia, Abbot, 25 April, a couple in the collection of Escher Zollikofer in Zürich; H. K. Morrison, both sexes, many specimens. Palatka, St. John's River, March, O. Sacken, and Appalachicola, Florida, R. Thaxter.

RACE APICALIS.

Calopteryx apicalis Burm. Hdb. v. 2, 227,8. Selys Monogr. Cal. 23,3; Synops. Cal. 9,3. Walk. Catal. Br. mus. 591,3. Hagen Synop. Neur. N. A. 56,2; Synops. Odon. N. A. 21,2.

The smallest known species; nearly related to *C. dimidiata* but smaller and more slender; male metallic green or blue; labium, head below black; labrum, epistoma, second joint of antenna brassy green or blue; tubercles on occiput very sharp; thorax metallic green or blue, also the parts near abdomen; all sutures black; thorax below yellowish; legs black, hind legs reaching to the fourth segment; abdomen metallic-blue and green; below black; appendages black, similar to *C. dimidiata*; wings narrow, 7 mm. broad, hyaline, the sixth part of the apex black, with inner border straight; reticulation black, costa steel blue; antecubitals 18 to 23; quadrangular space 4 to 6 transversals; sinus before the wings with the posterior border sinuated.

Female similar to the male, brassy green; second suture of thorax and the abdominal border, and below yellow; apical segment of the abdomen below with two teeth on the border; wings hyaline without pterostigma or with a very small white one, filling one cell, or a little dilated in three cells; reticulation black, costa steel-blue.

	Male	*Female*
Length,	43–45	43
Abdomen,	35–37	32
Exp. alar.,	57	57

HAB. Burmeister's types from Philadelphia, Pa.; two males, one female without pterostigma; a couple from the same locality by Ph. R. Uhler with a small pterostigma. Waltham, Mass., July 21, 1864, by Ph. R. Uhler one male and two females, with a more developed pterostigma; South Reading, Mass., by Frank Stone.

GROUP 2. Wings dilated; the hind margin visibly rounded.

4. CALOPTERYX AEQUABILIS.

CALOPTERYX AEQUABILIS Say. Journ. acad. Philad. v. 8., 23,2. Edit. Le Conte, v. 2, p. 405. Hag. Proc. Bost. soc. nat. hist. v. 15, 274,40.

Male, steel blue or brassy green; head dark, somewhat brassy; tubercles of occiput short, blunt; antennae black; labrum black; thorax with a fine, wavy, yellow line above the legs; upper appendages black, strong, curvate, the apical half externally with strong spines, internally dilated, after an excision followed by a short tooth;

inferiors a little shorter, straight, stout, flattened on tip, black; basal half below as well as the last segment, and the part before the valves of the segment bright yellow; legs black; wings hyaline, with yellowish tinge on the base; tip large blackish; fuliginous, occupying the fourth of the length on the front wings, inside ending in a convex but rather suffuse border, occupying the apical third of the hind wings, ending inside in a straight border; venation black, costa steel blue; 26 to 30 antecubitals, 6 in the quadrangle; one series of cells between the veins; postcostal space with nearly simple net of cells.

Female, similar to the male but entirely brassy green; labrum yellow, bordered with black anteriorly and on the basis, with a median triangular spot not reaching the anterior border; second joint of antenna yellow externally; thorax above the base of the legs and along the second suture yellow; abdomen brighter, a dorsal median band, the sides and valves yellow; wings with a stronger yellowish tinge, the apex of the front wings somewhat smoky; third apical part of the hind wings more decidedly smoky, but the inner border suffused, not well defined; pterostigma large, white; feet black.

	Male	*Female*
Length,	45–60	46
Length abd.,	36–40	38
Exp. al.,	60–68	71
		Female
Lat. al.,		9
Long tib. post.,		10
Pterost.		2

HAB. Montreal June 12 to 26, Mr. H. H. Lyman, male and female: Quebec, Canada, Mr. Provancher, male; Norway Maine; Mr. S. I. Smith, male and female; Bethel, Maine, L. Agassiz, female; Brookline Mass. and Tyngsboro, Mass., Mr. C. S. Minot; Lawrence, Mass., Mr. J. H. Treat, male, 16 specimens.

Race HUDSONICA, Hag.

Calopteryx hudsonica, Hag. 1875. Selys, 4 Add. p. 7, 6 bis.

I have before me only one male, end of abdomen wanting, and two females, one of them a fragment. All are collected by Mr. Barnston at Michipicoten Lake Superior, northern shore.

Until now I have not seen good and sufficient specimens of *C. aequabilis*. I am now of the opinion that *C. hudsonica* is not specifically different from *C. aequabilis*. There are some characters, which may be striking enough to allow it to be considered as a peculiar race. First, it is visibly stronger and more bulky in the thorax, head and abdomen. The dimensions are not larger than the largest ones noted for *C. aequabilis*. The male has the legs pale, which may be due to a lack of development, as I do not find pale legs in a younger male from Norway, Me. The wings are a little stronger tinged; antecubitals 33. The females are older, the colors more finished. More specimens are needed before a satisfactory conclusion can be reached. The female, described from Hudsons Bay, is similar. Perhaps the *C. virgo* from Greenland mentioned

by O. Fabricius, and seen by nobody later, may nevertheless belong to this species, as it is not credible that O. Fabricius could have mistaken this well known and striking insect.

Race YAKIMA.

Calopteryx yakima Hag. n. sp.*

Male, steel blue; head dark; labium and antenna black; tubercles of occiput blunt, short; thorax brassy, sides with a very fine, transversal, yellow line above the legs; upper appendages black, strong, curved, with a number of strong spines on the apical half externally, dilated on the same half internally, the dilatation beginning after a tooth, tip rounded; inferiors a little shorter, stout, somewhat flattened, on tip, black; yellow below on basal half; last segment, and the segment before the genital valves yellow below; wings hyaline, base a little yellowish, apical third, a little more on hind wings black, internally cut in a straight line; venation black; costa steel blue; 22 to 30 antecubitals; 8 transversals in the quadrangular; feet black with long spines.

Female, dark brassy green; labrum black on each side, with an oval yellow transversal spot; second joint of antennae yellow at base externally; sides of thorax with larger yellow bands above the legs, prolonged at the transversal sutures; appendages black, long, pointed; a broad, yellow, dorsal band on the penultimate segment, and a narrower one on the last segment; the final dorsal spine black; valves yellow; wings as in the male, hyaline, more yellowish at the front border to the nodus; apex blackish exactly in the same manner, but not so dark, as all specimens are younger; pterostigma milk-white, 2½ mm. long.

HAB. At a place called Lone Tree, near the Yakima River in Washington Territory, collected by my assistants and myself, 13 specimens, 5 of them males; June 30 to July 18, 1882; all more or less with unfinished colors except two males, which were among the first lot, collected in June.

Long corp. 51 mm.; abdomen 40; wings 32; tibia post. 11.

The discovery of a species of *Calopteryx* west of the Rocky Mountains, was very unexpected and rather startling, the more as the species seemed to be different from all known to occur in North America. The nearest eastern species is *C. hudsonica* from Michipicoten on the northern shore of the Lake Superior and still farther east *C. aequabilis*. During the last years my attention was drawn to the appearance of western species in the eastern states, namely in the northern part of western New York. One of the most striking of my discoveries is the identity of *Cordulia lintneri* collected from Center, N. Y., with *Lib. vacua* Hag. (no descr.) from Saskatchewan and Lake Winnipeg. I cannot but believe that some of the northwestern species pass east by the passage above Missoula, Montana, where the principal range of

*Yakima is a nomen proprium as matrona, margarita, sappho, etc.

the Rocky Mountains ends, and perhaps by the upper parts of the Columbia River. As far as I know, such species are to be found along the northern shore of Lake Superior and then cross over to western New York; such species are, until now, not to be found in eastern Canada or in Maine. Of course when species can come east in such a way, it is possible that some could go west in the same way, and would be. perhaps, modified by the climate. So I found it necessary to compare carefully with *C. yakima* the *C. hudsonica* from Michipicoten and *C. aequabilis*.

5. CALOPTERYX MACULATA.

Agrion maculata Palis. Beauvois 85 pl. 7, f. 3 (aberratio).

Calopteryx maculata Burm. Hdb. v. 2, 829.17. Rbr. Neur. 222,5. Selys. Monogr. Cal. 27,5; Synops. Cal. 10,5. Walker, Catal. Br. mus. 592,5. Hagen Synops. Neur. N. A. 57,4; Synops. Odon. N.A. 22,6; Stett. ent. zeitung, v. 24, 372,26; Proc. Bost. soc. nat. hist. v. 15, 274,40; v. 16, 364,53.

Calopteryx opaca Say Journ. acad. Philad. v. 8, 32,2 male.

Calopteryz materna Say Journ. acad. Philad. v. 8, 32,1, fem. (Drury L pl. 42, f 2).

Calopteryx holosericea Burm. Hdb. v. 2, 828,13. Rbr. Neur. 226,14 (erroneously f. Java).

Libellula virgo Drury v. 1, 113 pl. 48, f. 2; edit. Westw. 118.

Calopteryx papilionacea Rbr. Neur. 222,6.

Male, metallic blue; head below and second joint of antenna black; labrum black, shining; tubercles of occiput blunt, more or less short; thorax metallic blue, sides and below black; legs black; abdomen metallic blue, the last segments below and the inferior appendages below entirely reddish; wings dilated in the middle, rounded below, black more brown on base, which is on the base more or less hyaline; reticulation very dense.

Adult males sometime occur with irregular hyaline spots, figured by Palisot Beauvois as his *Agr. maculata*.

Male junior, similar, but the wings hyaline, pale gray; axillary callus and costa steel-blue.

Female, head and thorax metallic green or brown; abdomen brassy brown; last three segments with a pale yellowish band, broader on the penultimate; black below; wings very variable in shape and color; sometimes as broad as third of the length; always a milk-white pterostigma, quadrangular, the corners rounded, 2 mm. long, or very large oval, 4 mm. long; color as the younger males, with a brownish tinge, darker along the basal half of the costa and on the apex of the hind wings; sometimes darker brown with the apical quarter of the hind wings or also the front wings dark brown; the darkest colors in the south from S. Carolina to Florida; the northern specimens paler.

Antecubitals less than 30, rarely 19; quadrangular space 5 to 9 transversals, or a few more.

	Male	*Female*
Length,	44–48	32–50
Abdomen,	34–40	30–32
Expan. alar.	50–66	54–66

HAB. Common, nearly everywhere. I have seen the types of Burmeister, Rambur, Selys and Say in Harris collection. Canada, Quebec; Maine, Norway; Massachusetts, everywhere; New York; Wisconsin, Upper Wisconsin River; Illinois; Ohio; Maryland; Kentucky; Kansas; N. Carolina; S. Carolina; Georgia; Washington, D. C.; Tennessee; Florida; Texas.

The species described will perhaps have to be reduced to four. The material known for *C. angustipennis* is decidedly not adequate; if a larger number should prove the differences given for *C. amata* not persistent, the two species will belong together. I acknowledge this to be possible; after our actual knowledge the union can not be proposed on mere guessing.

C. dimidiata and *C. apicalis* have to be accepted as belonging to the same species.

C. aequabilis has nothing to do with *C. dimidiata*. *C. maculata* is very striking, and surely different from all the other species.

C. splendens Hagen Synops. Neur. N. A. 58.6 is surely not to be found here. It was quoted after a specimen in Escher Zollikofer's collection, said to have been sent from Georgia by Abbot.

A CONTRIBUTION TOWARDS A KNOWLEDGE OF TERMITES.[1]

BY BATTISTA GRASSI, CATANIA.

We will begin with *Calotermes flavicollis*. I am able to state that individuals (young nymphs) provided with short wings,[2] wing pad of Hagen, can be developed into supplementary kings and queens.

These supplementary kings and queens are:

1. Individuals (youngest larvae of Fritz Müller) which are not developed enough to be considered either as soldiers (in *Calotermes* there are no workers) or as sexually mature forms with fully developed wings (winged individuals of Fritz Müller.)

2. Sexually mature larvae and nymphs with longer or shorter wings. I have some supplementary kings and queens two and three years of age which show the same characters that they did at the time of their election, and consequently they do not show the slightest development of the wings, the color of the body alone has become darker (yellowish brown).

The sexual organs of the supplementary kings and queens are identical with those of the true kings and queens. The anal appendages which are always present in the true queen are often

[1] Translated from Entomologische Nachrichten, Juli, 1889, 15 Jahrg, No. 14, p. 213-219.

[2] I use this term in the Fritz Müller sense, for the first formation of the wing, just as wing-stump (scale) is used for what remains after the wing is torn off.

wanting in the supplementary queen; they are always present in the supplementary king and the true king.

I have tried very many times to produce supplementary kings and queens, but always with the same results, which I have already published.

We will now take up my observations on *Termes lucifugus*.

The nymphs of the second form (*Lespès*) usually become mature about the month of August, almost always in the nymph form with longer or shorter wings. Their comparison with the supplementary kings and queens must therefore be accepted as proved, although it depends here upon a complicated and unusual phenomenon which gives the colony of *Termes lucifugus* a very peculiar appearance. I have studied the termites for more than five years and among thousands and thousands of *Termes lucifugus* have never succeeded in finding a true king or queen with wing-stumps, that is to say the remaining stumps after the perfect wings have been torn off.

In past years I have had many little colonies of winged individuals confined in cages and later in the natural course met with true kings and queens. If one looks for *Termes lucifugus* about the middle of the month of May in the dead wood of certain kinds of trees he will 'find youngest larvae, larvae of various stages, many young nymphs of the second form, partly of the male and partly of the female sex, and many individuals incapable of reproduction (workers and soldiers) whilst in other trees, chiefly in the dead roots, in addition to all the above mentioned larval stages and nymphs of the second form, many masses of eggs in different stages of development and hundreds or indeed even thousands of mature females with swollen abdomens and showing a certain quantity of small roundish bodies (spermatozoa) in their spermatheca.

That the above mentioned eggs were laid by these females one can easily convince himself if he will place some of the latter in a frame with a few pieces of moist tender wood—it is understood that the transfer of the eggs has been guarded against—and leave them undisturbed; after one or two days they begin egg-laying and soon find for themselves different nests in the frame. These females can be directly separated from the nymphs of the second form, possessing of course the characteristics already mentioned by me in another place, that is short wings, brown facetted eyes, etc., and are to be compared therefore with the supplementary queens (I shall call them complementary queens.)

In the preceeding month, April, one finds out of doors almost the same conditions except that the nymphs of the second form (there exist nevertheless many larvae capable of reproduction) and the eggs are wanting, whilst the winged forms swarm in hundreds or thousands.

During the winter months (from December to March) the termite colony appears to us almost exactly as it does in April, in place of the winged forms

you find nymphs, that is nymphs of the first form. In general the development of the termites ceases during the winter months. For the autumn months my observations are incomplete. It is nevertheless certain that in the month of August the nymphs of the second form have already become complementary kings and queens; they conceal themselves in the remotest parts of the nest, copulate and the queen lays eggs until November. The complementary kings as a rule die before the beginning of winter, only a few live until December. I have never found one of them after the month of December.

Taking all these important facts together and many others which I have but partially given here we come to the following conclusions: the termite colony produces yearly an immense number of sexually mature individuals. Those mature in spring, acquire completely developed wings (winged forms) and leave the mother nest in order as kings and queens to form a new colony, a happiness however they but rarely share (in this I partly agree with Fritz Müller).

But those which mature in summer acquire only wing-pads, remain in the nest, copulate and reproduce (complementary kings and queens). The complementary kings die before the beginning of winter so that the queens are left alone: the latter cease to lay eggs during the winter and spring, but in May they commence again when they make use of the spermatozoa they have had in their spermatheca since the preceding fall. How long these complementary queens are able to live I do not surely know, but you find some of a dusky (yellowish-brown) color, somewhat like the nymphs of the second form, and others wholly of a dark brown color, many of these have longer wings than the others and this occurs not only with the dark brown forms but also with those of a yellowish brown color. All the complementary queens which are found in the same colony have very nearly the same color and but little variation in the length of the wings. Whilst therefore the difference in color in the complementary queens might at first sight lead us to think that they live several years, my additional facts make it much more probable that they die about the month of August and certainly by the time the new complementary kings and queens mature. The difference in color shows therefore a simple variation just as the difference in the length of the wings. However we will leave the definite solution of this question for future research and we come now to the results of the yearly production of complementary kings and queens. We will suppose that in one place tree A is found invaded by *Termes*, then we shall see after a certain time, that is when the population (living colony) in the above tree A has reached a certain size, the colony extends to the neighboring tree B: the complementary queen however remains in the first tree A. The extension takes place either under ground or directly in the air thus it frequently happens

that we discover the *Termes* underground between two trees occupied by *Termes* or also find trees, the dead parts of which are inhabited by *Termes* without being able to find the slightest sign of a communication with the neighboring nest.

One easily sees that he only has a partial nest from the fact that the complementary queen is found in one of these trees whilst she is wanting in all the others; all other individuals including the youngest larvae are found in both trees only the latter are in far greater numbers in the tree in which the complementary queens are found. If we suppose that the above migration from tree A to tree B to have taken place in the month of March then we shall find in April that nymphs of the second form exist in the tree A as well as the tree B and that in August numerous pairs of complementary kings and queens have developed in both trees from these nymphs of the second form.

In the natural course of time thousands of other trees can be infested from the described tree B and thus a whole territory may be invaded from a single colony; in the same way the *Termes* colony is immortal and compensates for the great difficulty in the foundation of new colonies.

However if we take a fragment of a termite nest without a royal pair at a time when the nymphs of the second form have not yet developed or such a fragment in which only some few of the same are to be found and insulate it so thoroughly that no communication with the mother nest can take place, we shall then see individual *Termes* more or less numerous 20-30-40 which are still undifferentiated (youngest larvae) or young larvae capable of reproduction, that is to say provided only with the first rudiments of the wings, bring forth supplementary kings and queens. It is very probable also that the nymphs of the first form can be metamorphosed into supplementary kings and queens, but I could not determine this, however I deny that the workers or soldiers of both of these stages can be changed into supplementary kings and queens.

The following is another important fact; in each termite nest in which nymphs of the first form, or white winged ones, are found there are always two or three females to one male. On the other hand one will find at the end of the period of swarming, that is at the time when only a few nests swarming with winged individuals are to be met with, in each one of the nests among these winged ones, either only males or only females, very rarely one finds a male among the females.

How these occurrences were related to each other during the time of the greatest swarming I was unfortunately unable to observe, but conjecture that the females were confined to one part of the nest and the males to another part and that they migrated independently of each other and also at two different times. The object of this being to prevent the formation of new colonies between close blood relations, a formation which I sometimes obtained by skil-

fully placing a certain number of white winged forms taken from one and the same nest beneath a frame. The involuntary inhabitants of these frames changed their color, lost their wings to the scale, copulated and never attempted to leave their case and in May the females began to lay eggs.

In what way are the complementary or supplementary king and queen developed? Alas for this answer I must confess myself at fault but I can state for the *Calotermes* as well as for the *Termes* that all individuals during the time of casting their skins lose the protozoa which they have in their caecum in greater or less quantities. Immediately after casting the skin they acquire them again except such individuals as are designed for supplementary or complementary kings and queens do not acquire the protozoa again (the fact is proved in one to five hundred supplementary and complementary kings and queens from many nests); very soon they become darker colored and by degrees they are sexually mature. Meanwhile the usual food was continued, whether it was at any time added to I do not know but it is certain, as I have already said, that the protozoa do not appear again. But if we consider that the mass of the protozoa in the soldiers, workers and the larvae is always the same, that they change the caecum into a sac which presses on the sexual organs so that one involuntarily believes that these protozoa must be the cause of the infertility of the soldiers and workers[1] and that the *Termes* by avoiding these protozoa can hasten the sexual maturity of the individuals destined for supplementary and complementary kings and queens. In what manner and way this happens I have as yet been unable to discover.

[1] In the nymphs of the first form of the *Termes*, in the nymphs of the *Calotermes*, in the winged forms and the true royal couples of both species the protozoa are found in small quantities.

REVIEW OF THE FORMS BELONGING TO THE TERMITE COLONY.

TERMES LUCIFUGUS.

1. Youngest larvae.

2. Larvae unfit for reproduction.
   - 5. Larvae of soldiers.
     - 7. Soldiers.
   - 6. Larvae of workers.
     - 8. Workers.

3. Larvae fit for reproduction.
   - 9. Nymphs of 1st form.
     - 12. Winged forms.
       - 14. True royal pairs.
   - 10. Nymphs of 2d form.
     - 13. Supplementary royal pairs. ?
   - 11. Supplementary royal pairs. 2.
     - 15. Complementary royal pairs.

4. Supplementary royal pairs. 1.

CALOTERMES FLAVICOLLIS.

1. Youngest larvae.

2. Larvae unfit for reproduction. 3. Larvae fit for reproduction. Supplementary royal pairs. 3.

5. Soldiers. 6. Nymphs. 7. Supplementary royal pairs. 4.

8. Winged forms. 9. Supplementary royal pairs. 5.

10. True royal pairs.

1. Found only when No. 14, 15 and 11 fail, or the last two present in insufficient numbers.
2. " " " " 14, 15 and 4 " " " " " represented in insufficient numbers.
3. " " " " 10, 7 and 9 fail.
4. " " " " 10, 9 and 4 fail.
5. " " " " 10, 7 and 4 fail.

NOTES ON ASILIDAE.

BY S. W. WILLISTON, NEW HAVEN, CONN.

In the preparation, some time ago, of a catalogue of the South American *asilidae*, and a partial study of a Brazilian collection, I made a number of notes, some of which seem of sufficient interest to publish. The catalogue includes no less than five hundred and forty names, not counting known synonyms, located under seventy-seven genera. The determination of species from among some of these is a dreary task, and in such genera as *Erax*, with its seventy-six "species," or *Mallophora*, with fifty-six, almost impossible, save by the aid of large collections. Undoubtedly there are many synonyms among the names, yet enough must remain to demonstrate the richness of the South American fauna in this family.

In a comparison of the generic names I have found several preoccupied, for which I would propose the following: For *Laparus* Loew, non Billberg, NEOLAPARUS; for *Cylindrophora* Philippi, LYNCHIA, in honor of Enrique Lynch A.; for *Phoneus* Macquart, NEOPHONEUS; and, by the strict rights of priority, in which I fully believe, *Neomoctherus* O. S. must give place to HELIGMONEURA Bigot, and *Andrenosoma* Rondani to NUSA Walker.

It is very singular that Schiner, with his entomological acuteness should have so misunderstood the genus *Senobasis* Macquart, as he seems to have done. Macquart's characters were as follows: "Charactères génériques des Dasypogons. Troisième article des antennes à base très menues et extrémité fort renflée et ovale. Abdomen à base rétrécie; armature copulatrice ♂ à pièces latérales en forme de crochets allongés. Cuisses mues. Ailes: quartrième cellule postérieure fermée, à nervure terminale arrondie." In his figures of *S. analis*

he adds a short style to the antennae, of which he says nothing in the description, and which does not in reality exist. Now this peculiar structure of the antennae was what Schiner emphasized as the characteristic of *Lochites*. The narrowing of the base of the abdomen in Macquart's *analis* is slight, and but little more than occurs in some of Schiner's species. Not only are the genera the same, but I am not sure but that some of Macquart's and Schiner's species may be. Several species that I have examined convince me that the narrowing of the abdomen at the base is a very trivial character. Schiner referred to *Senobasis* the species of *Blepharepium*, with an elliptical third antennal joint, forms totally different. Bigot seems equally to have misunderstood the genus, which perhaps is not strange. *Lochites* must therefore be dropped, which is all the more necessary from the fact that the name was twice used before Schiner's. I leave to the purist the emendation of the name *Senobasis*.

The species from North America referred by me to *Aphamartania* Schiner, does not belong there, as true specimens of the genus prove; where it does belong I do not know.

In the collection are specimens of a *Deromyia* closely resembling *D. miselus* from North America, with the fourth posterior cell closed. Baron Osten Sacken (Biol. Centr. Amer. 173) refuses to accept the identity of *Diogmites* and *Deromyia*, or, accepting it, would place the latter as a synonym or subgenus of the former. I cannot agree with him. Philippi's description was as good as Loew's and a year earlier. I can see no reason whatever for rejecting Philippi's name, and, until further evidence from Philippi's type species is at hand, the name *Diogmites* should be dropped.

Schiner located the genus *Pseudorus* Walker under the *dasypogoninae*, and attributed to it three submarginal cells, expressly stating that he had examined two specimens. A specimen that I have examined, and which I believe to be *P. piceus* Walker, has the marginal cell closed and with but two submarginal cells, agreeing in both respects with *P. bicolor* Bellardi. The genus is closely allied to *Doryclus* Jaenn.

Mr. Roeder has recently (Berl. ent. zeit. v. 21, 76) fully discussed the synonymy of *Doryclus* and *Megapoda* Macq., distinguishing them as genera, and clearing up the confusion of the species. Specimens of the two type species, *Doryclus distendens* (Wied.) Jaenn. and *Megapoda labiata* (Fabr.) Macq., convince me that he is quite right in separating the forms. Not only the characters of the legs, but the general habitus also, and the form of the face, are fully sufficient, in my opinion, to distinguish them. *Pseudorus* exists with less right than does *Doryclus* it seems to me. There is considerable variation in the three specimens I have examined, both male and female, of *D. distendens*, so that I am not prepared to say that the specific synonymy is correctly given by Roeder, but it

seems extremely probable.

Both Lynch and Osten Sacken have commented upon the difficulty of identifying the described species of *Atomosia*, and I can agree with them. There seem to be numerous structural characters that have been but little used, either for generic or specific discrimination. As a contribution to the better definition of the *Atomosia* group of genera, I offer the following:

A.—Third joint of the antennae longer than the first two together, without style; eyes on the side of the front emarginate, the front not widened above; scutellum with bristles; first posterior: cell usually narrowed; body punctulate.

Atomosia Macq.

"Third antennal joint longer than the first two together, without distinct style [front?]; scutellum without bristles. Hind femora with spinous bristles; hind tibiae feebly ciliate within. Body punctulate."

Rhathimomyia Lynch.

"Third antennal joint longer than the first two together, without distinct style [Front broad above?]. Abdomen much constricted at base, not strongly punctulate; wings and legs long."

Eumecosoma Schiner.

"Third antennal joint at least three times as long as the first two joints together, without style. Large species." [Front? punctulation?]

Aphestia Schiner.

Third joint of antennae longer than the first two together, with a terminal style; eyes not, or but very slightly emarginate on the sides of the front, the front much wider above; scutellum without bristles, or with hair-like ones. *Atonia*, gen. nov.

First joint of antennae about as long as the third, the latter without terminal style. Front much widened above, the eyes disciform and with enlarged facets in front; scutellum with weak bristles; body punctulate.

Cerotainia Schiner.

First joint of antennae as long as the third, without style. Scutellum without bristles. Abdomen punctulate, slender. Thorax remarkably projecting forward in a hemispherical, constricted eminence. *Cyphotomyia*, gen. nov.

Third joint of the antennae longer than the first two together, without style; front wide above; scutellum with fine bristles; seven abdominal segments visible in the male from above; abdomen smooth, not punctulate.

Lamprozona Loew.

The genus *Atonia* is, I believe, well founded, and will include a number of species, such as *A. ancyloccra* Schiner, *A. mikii* Williston, etc. *Cyphotomyia* is perhaps more doubtful, but the entire absence of bristles on the scutellum, and apparently also on the ocelligerous tubercle, together with the remarkable development of the thorax, will, I believe, justify its erection. The species

upon which it is based I do not find anywhere described, and so give it here.

Cyphotomyia lynchii, sp. nov.

Antennae black, long (about as long as the hind femora); first joint about as long as the third, with hairs above, and a few bristles below; second joint short, with bristles; third joint slender, pointed, without style, black pubescent. Face and front densely yellowish gray pubescent; face a little wider above, very slightly projecting below, with a few fine black bristles on the lower part. Front very deeply excavated, and very broad above, the inner margins of the eyes convex, the ocelligerous tubercle small and (in the single specimen) without bristles. Head nearly twice as wide as high, flat, the eyes disciform, and with distinctly enlarged facets in front. Proboscis not long, truncate, black. Thorax black, punctulate; mesonotum remarkably projecting above in front, forming a hemispherical protuberance, laterally constricted at its base. Abdomen black, slender, acuminate, strongly punctulate, the segments without lateral bristles. Femora black, tibiae and tarsi yellow, except that the tips of the four anterior tibiae, the distal part of the hind pair, and the last two or three joints of all the tarsi, are brown or blackish; tibiae and tarsi with slender yellow bristles; hind tibiae on the inner side with yellow pile as in most species of *Cerotainia* and *Atomosia*. Wings lightly infuscate (from the microscopic pubescence); petiole of marginal cell long; first and second posterior cells of nearly equal width distally, long; veins at outer end of the discal and fourth posterior cells nearly in the same straight line; small cross-vein before the middle of discal cell. Length 5 mm.

One specimen, Chapada (near Cuyabá) Brazil, H. H. Smith.

Schiner long ago (Verh. zool.-bot. Gesellsch, 16,664) called attention to the artificial position of *Atractia* among the *asilinae*, sensu auctorum. I can only reiterate it, and protest against any classification that separates the genus from the immediate neighborhood of *Atomosia*, sensu strictiori. Indeed, as Schiner says, when the third antennal joint in any specimen is wanting, the species will be unhesitatingly referred to that genus. To separate *Atractia*, then, into another subfamily on the slight difference between a slender style (as in *Atonia mikii* Will.) and a short bristle, is absurd. *Atractia*, at present, includes but four species, three from South America, and one from Central America. Two additional species are represented in the Smith collection. Another species, of much larger size, and different appearance, also new, but more nearly related to some of the described species, has the abdomen entirely smooth, without punctulation, the proboscis longer, etc.; it may require the erection of a new genus for its reception. As in many of the species of the *Atomosia* group of genera, all these species have a minute projection on the upper border of the third antennal joint.

In the Ann. ent. soc. France, 1889,

p. 183 Bull., Bigot, in his characteristic way, proposes a new generic name, *Pseudarchilestes*, for *Dasypogon albitarsis* Macquart. The author could have hardly comprised more errors in one short note than he has done. First, Schiner first described the genus *Archilestes* (*Archilestris*) in the Verh. zool.-bot. gesellsch. 1866, v. 16, p. 672, and *not* in Reise der österreichischen fregatte Novara, which appeared two years later. Second, he says nothing about *D. magnificus* Walker, being the same as *D. albitarsis*, but, on the contrary, places *D. albitarsis* as a synonym of *D. capnopterus* Wied. (*op. cit.*, v. 16, p. 703; v. 17, p. 377), the type of the genus. Had Bigot been at all familiar with what Schiner has written, he would have observed that Schiner says expressly (Verh. zool.-bot. gesellch. v. 17, p. 378) that the third antennal joint in *A. capnopterus* is "*auf der Oberseite behaart*," the very identical character that Bigot assumes as distinctive of his *Pseudarchilestes!* Furthermore, Schiner says nothing in his original generic description about the third joint not being hairy above. That he does say so in a later description was undoubtedly an oversight, that should not have been accepted so heedlessly. In a word, Bigot erects a new genus upon the type species of another genus, based upon a character that was expressly stated to be present in that type. *Archilestris magnificus* Walk. has, likewise, the "third joint of the antennae distinctly beset with hairs on the upper side." (Osten Sacken, Biol. Cent.-Amer., p. 169.)

I wish to substitute *Myiothera* for *Lynchia*, p. 255, as I find the latter was used by Weyenbergh in 1881.

NOTES ON THE EARLY STAGES OF SOME HETEROCERA.

BY CAROLINE G. SOULE AND IDA M. ELIOT.

PANOPODA RUFIMARGO, VAR. ROSEICOSTA, Guen.

This larva was .28 mm. long, bright green, and found feeding on oak in Nonquitt, Mass., on 10 September, 1889.

The head was large, bright green, minutely speckled with black, and having a horizontal yellow line across the "forehead."

The body was bright, rich green, minutely speckled with black, and having subdorsal lines of bright yellow extending from the head to the end of the anal props.

On the first segment were four small yellow dots just behind the head, and two larger ones behind the four.

On the first and second segments were a faint yellow horizontal line, and three rough yellow tubercles.

There was a dorsal line of yellow dashes and the space on each side was

dotted with yellow, the dots becoming more numerous after the fifth segment.

There were nine obliques of clear yellow, their "trend" being the reverse of those of *Sphinx* larvae.

The feet and props were pale green with reddish tips, except the anal props, which were long, thin, and like the body in color.

All the props ended in curved and speading tips. The last moult was like the one before it, and occurred one week before the larvae spun leaves together for pupation. The pupa formed in five days from the spinning and was of a light brown color with no noticeable peculiarity. The moth emerged in June, 1889, and was kindly identified by Mr. John B. Smith.

CALLOSAMIA ANGULIFERA Walk.

These eggs were sent us by Miss Emily L. Morton, with no date of laying, but the egg-period is probably about that of *C. promethea*.

The eggs closely resembled those of *C. promethea*, but were whiter.

Many of the eggs turned lead color by July 20, but a few became green, and a few yellow. All hatched on 20 July.

The young larvae were 4 mm. long, and bright yellow with a dark head. The head had two light bands across it. There was a black transverse band on the top of the second segment. The anal segment had two dark transverse lines, and a dark line showed faintly between the segments.

The feet were grayish yellow with dark tips. Props yellow. Each segment had six warts and spines, except the first and last which had four.

27 July. First moult. Head yellow with a dark line and dark patch across it.

Each segment had two transverse black lines on dorsum. Body-color greenish yellow. On the first segment were four black warts with black spines. On the eleventh segment were three warts, the middle and largest one being on the dorsal line, and two warts just behind these. On each of the other segments were six yellow warts with yellow, black-tipped spines. Anal shield with a transverse line and patch of black. Feet and props pale yellow.

31 July. Second moult. Head pale green with dark mouth-parts.

Body whitish green, with two indistinct black lines on each segment, and a transverse row of yellow warts, each having a spreading crown of yellow spines. Just behind the head the row of warts was followed by a heavy black line.

Feet and props whitish green. Anal shield with a black line and patch.

6 Aug. Third moult. Head green, with black dots over the top and a black line across the face just above the mouth-parts.

Body very white-green, smooth, tapering from third segment to the anus.

From the third segment to the anal shield, there was a thick wavy ridge just below the spiracles. This ridge is one of the differences between these larvae and those of *promethea*. It

has been very noticeable in all the *angulifera*-larvae we have seen.

First segment. Two small yellow tubercles over the head, then on each side, two black, raised dots, and one just above the foot.

Second and third segments. Two large tubercles on the dorsum, black at base, ringed with yellow, orange at tips, smooth; two black points on each side, and one over the foot.

Two other segments, to the eleventh had, each, six black, raised points.

Eleventh segment. One large dorsal tubercle, of clear yellow ringed with black, and two black points on each side.

Twelfth segment. Four black points and two black tubercles on the anal shield. Anal shield and props edged with yellow, the props having a "horseshoe" of black on the outer side. Stigmatal ridge conspicuous. Feet and props whitish green.

12 August. Fourth moult. As before, but larger, and having tubercles of a bright coral red, instead of orange. These tubercles were ringed with yellow, and were black at base. The black "horseshoe" on anal props became a triangle of black, and each abdominal prop had a black dot on the outer side.

The yellow-white, stigmatal ridge, extending from third segment to anal shield, was very noticeable.

Spiracles inconspicuous.

23 August. Began to spin. Just before spinning the larvae measured nearly 75 mm. in length, and 44 mm. around the largest part of the body.

The dots and tubercles were small in proportion to the size of the larvae, and less conspicuous than those of *promethea* larvae. The tubercles were not erect like those of *promethea* larvae, and were ringed with yellow,—a marking which we have never found on *promethea*. The body was cream-colored above and somewhat greener on the venter, the yellow, stigmatal ridge, making a definite scalloped edge, ending in the anal flap.

The head was small in proportion.

The tubercles, the stigmatal ridge, and the smoother, *creamier* color form the most marked differences between *promethea* and *angulifera* larvae, which still closely resemble each other.

We have never seen an *angulifera* larva which would eat anything but the leaves of tulip-tree (*Liriodendron tulipifera*), while *promothea* larvae will eat almost any leaf!

The cocoons of *angulifera* were rounder, and in no case did the larva spin threads around the leaf-stem, or fasten the stem to the twig, while the *promethea* larva did this in every box where twigs were provided.

We feel that the two kinds are distinct and separate, although we have some *promethea* ♀ moths which are very near *angulifera* in their markings. The ♂ *angulifera* varies more from the ♂ *promethea* than the ♀ from ♀ *promethea*, although, in typical specimens, the difference is very marked.

Pheosia rimosa Pack.

Eggs, found on a poplar leaf, Nonquitt, Mass., 28 August, 1888. They

were white, opaque, hemispherical, and suggested eggs of butterflies, though they were smooth.

2 September. They hatched. Young larvæ ⅓ mm. long. Head, feet and props shining black.

Body whitish-green, with a subdorsal row of black spots, two to each segment; lateral row one to each segment.

Eleventh segment, a black dorsal tubercle.

First segment had a raised black patch, and looked swollen.

Second and third segments, two large black dorsal spots. Anal end black. Sparse hairs all over the body.

7 September. First moult. 19 mm. long. Head black above, and brown on face. Feet and props black.

Body green with slight yellow striations, and a black horn on the eleventh segment.

10 September. Second moult. 28 mm. long.

Head paler than the body, which was of a greenish-purple color, with the venter green, and a dorsal line somewhat darker than the body. Spiracles, conspicuous for the first time, black dots encircled with white.

14 September. Third moult. 38 mm. long. Head and body slate-gray, very smooth and shining. Anal shield rough, and the whole segment with a reddish tinge.

Caudal horn black, and from its base two black lines extended to the last spiracles.

Feet and props like body. Spiracles as before.

22 September the first one pupated.

Pupa, 25 mm., or slightly shorter, brown, smooth, slender.

First imago emerged 6 June, 1889.

Ichthyura inclusa, Hubn.

At Nonquitt, Mass., 12 July, 1888, we found on a poplar leaf, and almost covering it, a close mat of tiny eggs of the color and *bloom* of Delaware grapes. 30 July these hatched, giving larvae of a grayish color, with black heads, with stiff hairs, which, when the larvae were in motion, made them look as if they had props on each segment. There were black dots on each segment, and these were confluent on the first segment, making a black collar. Anal props were black.

The larvae were very restless, and ate only the pulp of the leaves. They grew greenish in a day or two.

8 August. They moulted. Head black, body green, with a few scattered hairs; collar black as before.

Fourth segment had a black dot on the back, as had the anal segment.

There were rows of black dots, lateral and sublateral, with black "speckles" between.

15 August. Second moult. Head black. Body yellow with sparse white hairs. On fourth and anal segments a black wart.

Dorsal and subdorsal longitudinal black stripes meeting at the black anal wart. A wider sublateral black stripe made of confluent dots; and a subventral black stripe. On these two stripes were black warts, one on each segment, and from these warts arose the white

hairs. Feet black. Props yellow, with black dots.

19 August. Third moult. Head and body color as before. Dorsal stripes and warts as before. Sublateral and subventral stripes dark gray with black lines through them, and with warts as before.

On the first and second segments two additional warts, making six on those segments and four on the others.

Feet black. Props yellow with black dots. Spiracles black. Soft, fine hairs all over.

2 September. Fourth moult. 44 mm. long, slightly hairy.

Head black, with white hairs scattered over it.

Body almost black with four dorsal lines of bright yellow; one bright, and several indistinct, lateral lines, and marks of yellowish.

On fourth segment a bifid black tubercle, giving rise to white hairs. On anal segment a smaller black tubercle. Subventral surface with considerable yellow.

Feet and anal shield black. Props yellowish-brown.

28 August. The larvae began to spin, either loose cocoons in corners of the tin, or inside leaves drawn together.

Pupa, 15 mm. long, of a bright chestnut brown color. First imago emerged

SPILOSOMA CONGRUA, Walk.

At Nonquitt, Mass., 7 June, 1889, we found a nest of small, opaque, white, globular eggs on a leaf of *Trifolium agrarium*. These eggs were exactly like some received the same day from Miss Morton, and laid by a ♀ *Spilosoma congrua*. We found several moths of *S. congrua*, flying in Nonquitt this year.

We watched the larvae through all their moults. comparing the two sets daily, and they proved the same throughout.

The eggs turned lead-colored the day before they hatched. They hatched 9 June. The young larvae were 4 mm. long, with black heads.

Body yellowish, with dark warts, from which sprung gray or black hairs. Anal shield dark. Feet and props like body.

They ate clover, but much preferred plantain even to the *Trifolium agrarium* on which the eggs were laid.

When touched they curled up and dropped from the leaf, like the other "woolly bears."

14 June. First moult. 6 mm. long. Head black. Body-color yellow, with black transverse dorsal lines between the segments; third and tenth segments darker in color. Feet and props like body. Warts dark, with sparse blackish or dark gray hairs.

17 June. The black transverse lines disappeared and the color on and around the warts was deep brownish-yellow.

18 June. Second moult. Head black. Body color deeper and browner yellow; warts darker, with hairs longer and more numerous.

22 June. Third moult. 15 mm.

long. Head and feet black. Body-color darker and browner than before, with a dorsal white line, and lateral orange line, broken between the segments.

Warts *shiny* black, with short very black hairs, growing in tufts.

27 June. Fourth moult. 21 mm. long. As before, only bigger and blacker, and with the hairs longer. Orange laterals deeper and brighter.

They move very rapidly with a quick, jerky motion, stopping suddenly when at the fastest speed.

4 July. Fifth moult. As before, only larger, and with denser hairs.

10 July. They were from 25 mm. to 29 mm. in length. Most of them were very active and voracious. If left without food for even a short time they would eat such of their number as were preparing to spin, and were therefore less vigorous than the rest!

11 July. Began spinning. Unless the cocoons of the earlier spinners were removed the pupae would be found half devoured by the larvae not yet ready to spin, even when there was plenty of food plant in the boxes.

The cocoons were oval, thin, with hairs spun into them. Pupa of bright chestnut color, short, stout.

Cressonia juglandis, A. & S.

Eggs, ovoid, pale green, laid about 7 July. They hatched 17 July; having grown yellow the day before.

Young larva, 9 mm. long, pale yellow, with short, yellow caudal horn: feet and props concolorous with body. Anal props extended, in trailing points, beyond the anal shield.

They ate walnut.

21 July. First moult. 15 mm. long, slightly rough. Head green, with a long, conspicuous point on the apex.

Body, feet, props, and caudal horn green.

The body had a longitudinal white line on each side of the dorsal line, extending from head to horn.

The larvae drank greedily. In two days the caudal horn grew brownish, and faint yellow obliques appeared.

27 July. Second moult. Head green, with two long brownish filamentous points at apex. From these points a brownish line extended down the back of the head. The head was granulated with yellowish-white points, and had yellow face-lines.

Body green, granulated with yellow-white, and having yellow obliques and subdorsal lines.

Feet and props green, the anal props having the trailing points as before.

Caudal horn brownish and granulated.

1 August. Third moult. Head green, very pointed, with white face-lines, and very bifid apex.

Body green, and, as well as the head and horn, thickly granulated with yellow white points. Horn long and usually held level with the body. Anal shield had two largish white tubercles.

8 August. Fourth moult. Head less pointed, though still shaped like an apple-seed.

Body as before. Anal shield bisected

by a vertical black line on each side of which was a white wart.

The long points on the head were replaced by reddish granules.

Spiracles red

The effect of the body was like the rough underside of the walnut leaves.

15 August. The white granules had become encircled by purplish brown lines, the lines being broader around the granules forming the obliques. The body was largest at the anal segment, and tapered rapidly to the head.

29 August. Stopped eating, being about 75 mm. long.

7 September. Pupated. As our specimens failed to cast the larval skin, the pupae were not sufficiently perfect to describe. We therefore quote Prof. Fernald's description, in his "Sphingidae of New England."

"The pupa is blackish brown, and roughened over the entire surface. There are four little prominences on the head case, and the terminal segments are flattened on the ventral surface, and have lateral, toothed appendages."

Our larvae did not correspond exactly with Prof. Fernald's description.

Paonias astylus, Drury.

On 7 July, 1889, a ♀ *astylus* emerged from a pupa formed by a larva found in the previous September. The moth was fastened outdoors the next night, but no ♂ was seen.

On 9 July she laid about sixty eggs. These were ovoid, and apple-green in color.

19 July. They turned yellow with an opaque green line, and the red caudal horn could be clearly seen.

20 July. The young larvae came out, eating only enough shell to allow them to pass, and crawling for hours with the iridescent shell still over the caudal horn.

Newly hatched larva. Head, green, round, with dark mouth-parts and a dark dot close to the palpi, on each side.

Body, pale green, granulated, with slight indications of yellow subdorsal lines from the head to the caudal horn. Caudal horn short, stout, rough, red at base, yellow in the middle, very dark red at tip, which was markedly bifid.

Feet and props green.

Ate *Vaccinium corymbosum*, and, afterward, *Gaylussacia frondosa*.

29 July. First moult. As before, except that the head was more pointed, the horizontal yellow lines were clearer, and the feet were red.

4 August. Second moult. As before, only larger, being 19 mm. long.

12 August. Third moult. Head pointed, bright green, granulated.

Body bright green, granulated with yellow white. Red dots and patches began to appear, set irregularly between the dorsal and subdorsal lines.

Faint yellow obliques appeared. Caudal horn short, stout, inclined forward, yellow around the base, then red, then yellow in the middle, and deep red at tip. It was granulated with rough tubercles most noticeable at the tip, which was formed by two pointed tubercles with a slightly smaller one between them.

These tubercles gave a very different effect from the bifid tips of the earlier stages, and, without a lens, the horn looked blunt at the tip.

Feet and props red-tipped.

21 August. Fourth moult. Head less pointed, color as before.

Body green, less roughly granulated with yellow.

Yellow obliques clearer. Yellow horizontal lines confined to the first three segments; and faint sublateral lines of yellow dots appeared on these segments.

The red dots and patches were more numerous, and of a clear, bright red. Four red dots appeared on the anal shield.

Feet and props red-tipped.

Spiracles, heretofore unnoticeable, were bright red. Caudal horn short, stout, very erect, green at base, then red, ringed with yellow in the middle, and tipped with deeper red, though not as dark as in the earlier stages.

The "bifid tip" was reduced to an ordinary tip ending in two small granules, not seen without a lens.

29 August. The red patches were larger and more numerous. In one specimen they filled the dorsal spaces between the obliques on the segments fourth to tenth inclusive. This specimen had a substigmatal row of red dots, wanting in the others. The caudal horn was less bright in color, and very short in proportion to the size of the larvae, which was now about 63 mm. long.

Mr. Peck, quoted by Mr. John B. Smith in his "Monograph of the *Sphingidae*," states that the "bifid tip" of the caudal horn or "these spines" forming the "bifid tip" "are constant from its hatching," but in no specimen which we have seen has this been the case. Nor have the colors of the horn been such as he describes them. Instead of a brownish or red-brown, the color has been, in every instance, a clear, bright red, matching the leaves of the high huckleberry and blueberry when "turning" in the autumn. In fact, the whole larva, when full grown, had the exact colors of these leaves, and the horn looked like the buds "set" for the following spring!

The larvae were very delicate, many dying in moulting, and those found were very subject to parasites.

5 September. Stopped eating and prepared for pupation.

8 September. Pupated.

Pupa of a rich chestnut brown color, with a sharp point on anal end.

31 mm. long, neither slender nor stout.

Paonias myops, A. & S.

Eggs roundish, green, laid 9 June and hatched 24 June.

Young larvae, pale yellow-green with pointed heads. Ate wild cherry.

30 June. First moult. Head green, pointed at apex. Body green, feet, props and horn concolorous with body.

3 July. Faint yellow oblique, and a horizontal yellow line on the first three segments appeared, also indistinct red spots.

5 July. Second moult. 19 mm.

long. Head green and very pointed, ending in a yellow dot at apex.

Body green, with, on each side, a yellow horizontal on first three segments, seven yellow obliques, each crossing two segments, and meeting its mate on the dorsal line. Red spots on dorsum and sides, irregularly placed, and varying in size, number, and position in the different larvae. Body thickly granulated with yellow dots.

Caudal horn short, red above and below, yellow on each side, from the last obliques.

Feet and props green, anal shield pointed.

14 July. Fourth moult. 31 mm. long. Head green, pointed, and with faint yellowish lines on each side.

Body green, with horizontal lines as before. Yellow obliques more distinct, the last ones being yellower and wider than the others, and reaching part way up the caudal horn.

Anal shield pointed, and edged with yellow. Caudal horn short, red above, green beneath, yellow at the sides.

Feet reddish, props green, spiracles yellow. In some specimens, the spiracles were set in small red patches.

The red spots varied very much in the different specimens, those on the fifth segments being most found.

In three specimens the red spots were surrounded by yellow.

In *all* the spots were of a clear, bright red, and not at all of the "brownish red" referred to by some writers.

The bodies were thickly granulated with yellow.

20 July. Stopped eating.

27 July. Pupated.

Pupa of a chestnut brown color, darker than that of *Dolba hylaeus*; smooth, neither slender nor stout, and about 31 mm. long.

DOLBA HYLAEUS, Drury.

A ♀, caught in Nonquitt, Mass., by a little girl, laid eggs between 6 and 15 August, the child did not notice the exact date.

The eggs were small, oval, pale green, becoming yellowish two days before hatching. They hatched on 17 August.

Young larva, 6 mm. long, pale green, with a caudal horn as long as the body. The horn was green at first, but grew black in two hours.

The larvae ate inkberry (*Prinos glabra*) but would not touch sweet fern.

They grew pinkish after eating, especially near the head and just before the caudal horn. Like most young sphingid larvae they spun silken threads as they moved about.

24 August. First moult. They became greener, and showed a faint white line on each side of the dorsum, extending from the head to the caudal horn. Feet and props concolorous. The horn was black, the segments around the base being whitish green. They ate their skins, except horn and mask, after each moult.

31 August. Second moult. Pale green, with a dark dorsal line, edged on each side with white, extending from head to horn.

Seven faint, yellow-white obliques could be seen on each side, the last being yellower and wider than the others, and extending half-way up the horn.

6 September. Third moult. 25 mm. in length. Head green, rounded. Body green, whiter on dorsum, with a deep green dorsal line. The white lines on each side of the dorsal line were hardly to be distinguished from the whitish dorsal surface.

There was a yellow, horizontal, lateral line, broken by the obliques, which were yellow edged in front with dark green.

The caudal obliques were yellower and broader than the others, and extended a little way up the horn. The horn was long, sharp, and rough, green at base, almost black elsewhere.

Feet and props green.

8 September. The body showed yellow granulations more dense on first three segments.

The yellow horizontal lines were confined to these three segments, and the last obliques grew whiter than the others, and were edged in front with blue-black.

The head was thickly granulated with blue-black. Feet red-brown at tips.

One specimen had the caudal horn of olive-green, very light at the tip.

11 September. Fourth moult. Head round, green, granulated.

Body green, granulated with yellow on the first three segments, venter, and the anal shield.

Dorsum very white-green, bisected by a deep green line from head to horn.

Yellow horizontals gone.

Obliques whiter, edged in front with dark green and a trace of blue-black. Last obliques much whiter, with a definite edge of blue-black.

Spiracles, noticeable for the first time, —blue-black encircled with white.

Caudal horn green at base and sides, blackish green above, and lighter beneath; slightly rough, sharply pointed, slender and long.

Feet green at base, ringed with yellow, tipped with blue-black. Props green. Anal shield edged with yellow green.

17 September. Fifth moult. Head blue-green dotted with small, dark granules. Mouth-parts dark.

Body yellow green, with the dorsum very white-green. First three segments granulated with white and venter slightly so. Obliques bright pink shading into yellow on the dorsum, and edged in front with deep green. The last obliques had white in place of the yellow, and continued, as white granules, one-third the length of the caudal horn.

Horn blue-green above and beneath. Anal shield slightly edged with yellow.

Dorsal line very blue-green edged on each side with white.

Feet green, and ringed with yellow, and with blue-black tips. Length 38 mm.

In two days the dark green edges of the obliques and of the horn had become very purple-black, the purple showing most beneath the horn.

26 September. 56 mm. long. As

before, except that the yellow granules were very indistinct; and the obliques next the head could hardly be traced.

The other obliques were bright pink, edged with deep blue-purple. Caudal horn was green at base, and blue-purple elsewhere, the "blue-purple" being of the exact tint of very ripe inkberries. Horn short in propoition to size of the larvae.

The spiracles were dark in ovals of white, these ovals being encircled by faint blue-purple lines. They were small, and merged in the pink obliques on six segments, but conspicuous on the others.

2 October. Stopped eating, being then 63 mm. long.

10 October. Pupated.

The pupa was 31 mm. long, neither stout nor slender, with a tongue-case 9 mm. long, and lying close against the body. Its color was green at first, and showed the dark obliques on the abdominal segments, but in two days it became bright brown. There was a point on the anal end, but no hook.

THE MALE ELEMENT THE ORIGINATING FACTOR IN THE DEVELOPMENT OF SPECIES.

BY JEROME MCNEILL, MOLINE, ILL.

Professor W. K. Brooks, in his study of the philosophy of heredity[1] has advanced a new theory which offers a reasonable explanation of the means by which ancestral characters may be preserved in any species and at the same time new variations transmitted to posterity. Without attempting to state the theory in full (this is the more unnecessary because it is probably known to a large majority of the readers of PSYCHE), it will be sufficient for the present purpose to say that the author considers that "the male element is the originating and the female the perpetuating factor in the evolution of species." Mr. Brooks offers no more convincing arguments in support of his views than the evidence from sexual characters, and while the illustrations drawn from entomology are probably the best that could be selected, it has seemed to the writer that it might not be uninteresting to note the application of the theory to the genera and species of as little known and little studied an order as that of orthoptera. In presenting this evidence I shall collocate it with the five propositions formulated by Mr. Brooks.

1. "In most animals of separate sexes, the males of allied species differ

1 The law of heredity, by W. K. Brooks, Associate on biology at Johns Hopkins university. Published by John Murphy and co., Baltimore.

more than the females from the ancestral type."

In the first place, assuming that the larvae and pupae are more like the ancestral forms than the imago, the females show less divergence from this form than the males in being more frequently apterous or abortive winged. When the wings are fully developed they are as a rule smaller relatively if not absolutely in the female, and there is perhaps no notable exception to this rule. The females also approach more nearly to the ancestral type in the frequently less developed antennae.

Throughout the order it is very generally true that the coloration is brighter and more contrasting in the male. In *Pezotettix viridulus* the male is bright pea green (in living specimens) with black pleural stripes while in the female the color is nearly uniformly dull brown. In the wings of most *oedipodae* the transverse black or fuliginous band is more extended in the male as are also the similarly colored spots in the usually transparent apex. In the same family the fuscous spots and bands of the elytra are not infrequently much deeper in color in the male. The genus *Acridium* offers some exception to this rule of coloration since, while on the whole the males are more brilliantly colored, certain species have the elytra as well as the head and pronotum obsoletely spotted or unicolored in the male, and obsoletely or distinctly spotted in the female, the latter being much more variable in this respect. This apparent departure from the rule may possibly be explained by the females retaining longer a larval or ancestral character. Unfortunately I have no knowledge of the larvae of these species to help me in deciding this point. But in the allied genus *Melanoplus* it is certain that the larvae are in many species much more spotted and streaked than the imagos. In *mantidae* generally the males have the elytra distinctly more membranous than the females. Since the elytra are, in orthoptera generally, protective in color and form as well as in structure, it might be expected that the only carnivorous family needing this protection least would be the first to outgrow it and it is quite in accord with Mr. Brooks's theory of heredity to find the males of *mantidae* leading the females in this change. In the genus *Melanoplus* the males show in the club-shaped abdomen a marked departure from the usual subcylindrical or tapering form of this part which is common in the saltatorial division of the order. The males of this genus and its allies *Pezotettix* and *Acridium* exhibit a peculiar development of the anal cerci which are generally of the simplest and most regular form in this family.

Finally the much more attenuate forms of the males of *phasmidae* certainly show them to be in advance of the stouter females in their divergence from the typical orthopterous form.

2. "Those organs that are confined to males or are of more importance or are more perfectly developed in them than in the females are much more likely to give rise to hereditary modifi-

ns than parts which are confined to re more perfectly developed in fe- s."

1 this point it will be sufficient to o mind that the organ which is al- entirely restricted to the males of *tidae*, *gryllidae*, and *acrididae* is nusical apparatus. In *acrididae* ıpparatus is too little specialized to r examination. In *locustidae* and *lidae* there is little evidence to be l of an unmistakable character, but ıst mentioned family has one genus *nthus* and the first mentioned two ra *Conocephalus* and *Orchelimum* h throw some light on the subject. :erning *Oecanthus* I may say the three most common species *niveus*, De Geer, *angustipennis*, ı, and *fasciatus* Fitch. These ies are usually considered to be varieties, and although I am satis- that the distinctions of form and :s and to a less degree of color en- them to rank as species, their distinct "songs" leave scarcely any ı for doubt. Of course this differ- in the character of stridulation is mpanied by a certain, though not picuous, difference in the structure e stridulating apparatus, and by its ng to vary in structure and use, ds greatly in establishing two spe- In *Conocephalus* and *Orchelimum* vidence is similar. The species for nost part are very similar and the certain means of distinguishing ı is in their songs.

"That a part which is confined to most developed in males is more likely than a similar female part to vary."

This principle is well illustrated in the anal cerci of the males of *Melanoplus*, *Pezotettix*, and *Acridium*.

This part which has been before remarked in the females is simple and constant in form, in the males is extremely variable in size and shape, so that in the two genera first mentioned, at least, it furnishes the best specific characters for distinguishing the species. In these genera also the males furnish good specific characters in the form of the last ventral segment, while in the female this part is very constant in form.

4. "That males are, as a rule — more variable than females."

Much of the evidence already given bears upon this point — and I will content myself with a very few mor examples.

The males of two species of *Tridactylus*, *T. apicalis* Say and *T. terminalis* Uhler have the anterior tibiae furnished with a very remarkable appendage.

The tibiae are divided into two forks nearly at right angles to each other. That fork which occupies the usual position of the tibiae ends in two strong spines. From its base the true tibia extends backward parallel with the thigh, with which it forms a raptorial apparatus. This brand ends in a strong curved claw — and a very diminutive tarsus which is placed at right angles to the tibiae. In these species the males are further distinguished from the females by the swollen pronotum.

In the genera *Centhophilus* and

Udeopsylla the males are very generally distinguished by the larger and more numerous spines on the lower margin of the posterior femora.

5. "That the male leads and the female follows in the evolution of new races."

Little remains to be said on this point since nearly all that has gone before shows already that in *orthoptera* male characters lead in the recognition if not in the evolution of new species. No student of orthoptera will question the statement that were it not for the variation of the cerci and the last ventral segments of the males of *Melanoplus* and *Pezotettix* it would not be possible to recognize nearly so many species in these genera as are now known to exist. It is also indisputable that in *Melanoplus* especially in several instances, it is practically impossible to distinguish with certainty between the females of closely allied species. Examples are not wanting of cases in which the males differ so greatly from the females, that they have been placed when first described in different genera. The male of *Chloealtis conspersa* Harr., differs so much from the female that Mr. Scudder in his ignorance of their relationship was quite justified in describing the male as *Stenobothrus melanopleurus*. The males of *Syrbula admirabilis* Uhler are of two forms; the green one, which is very rare, resembles the female in coloration but differs in structural characters, and especially in the clavate antennae. The dark form, in addition to the structural features which are very similar to those of the green form, is so very different in coloring that it was for a long time widely separated from the female, and as genera are now made, the sexes may be considered generically distinct.

It will be seen that orthopter furnish strong, if not striking, corroborative evidence of the truth of Mr. Brooks's theory of heredity. While I do not pretend, in this hasty review, to have exhausted the illustrations that might be furnished by the species and families represented in the United States I have not found any controvertive evidence except the considerable variation in the length and shape of the ovipositor of *Xiphidium*, that of the closely allied genus *Orchelimum* being quite constant, and the less marked variation in the length of the same organ in *Conocephalus*, *Thyreonotus* and *Gryllus*.

THE STRAWBERRY ROOT LOUSE (APHIS FORBESI N. S.)

BY CLARENCE MOORES WEED, COLUMBUS, OHIO.

[Partial reprint from Bull. Ohio agricultural experiment station, September 1889, v. 2, no. 6, p. 148-150.]

During the latter part of August Mr. S. R. Kramer, of Gahanna, Franklin county, Ohio, brought me specimens of a small louse infesting the roots of strawberry plants, which he reported to have ruined a plantation some two and a half acres in extent. An examination of the plants upon the station grounds showed that a large proportion of them were also infested by the same insect; and on inquiring of prominent horticulturists recently assembled at the state fair, I found that many of them were only too well acquainted with the pest, and that it is quite generally distributed over the state.

The insect proved to be a species of *Aphis*, to which attention was first called by Professor S. A. Forbes in the Thirteenth report of the state entomologist of Illinois (p. 102-103).

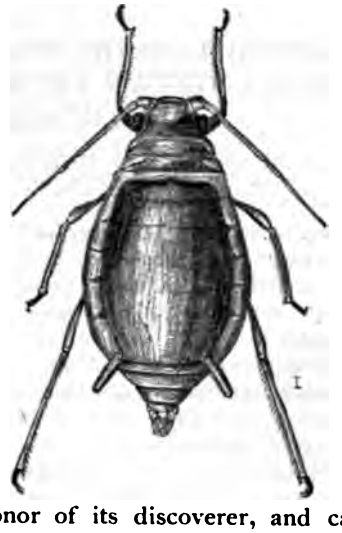
On the station plants the lice occur both upon the roots and lower portions of the crowns. In both situations they are carefully attended by the small brown ant (*Lasius alienus*) which mines about the roots, upon which it probably places the lice, and carries them away in its jaws upon the approach of danger —treating them in fact exactly as it treats the corn root louse (*Aphis maidis*) in corn fields. From the discovery of the deposition of the plant-lice eggs about the strawberry roots recorded by Professor Forbes, I surmise that the ants take care of them through the winter, in the same way that they have been found, by the author just mentioned, (Amer. nat., v. 21, p. 579) to care for the eggs of the corn root louse.

Mr. Kramer informs me that he first found these lice upon his plants about the middle of July, when they were very abundant.

A great many of the lice on the crowns and roots were infested with hymenopterous parasites.

DESCRIPTION.

Although Professor Forbes published an accurate description and figure of this strawberry root louse, he did not give it a specific name, and consequently I have proposed that it be named



in honor of its discoverer, and called *forbesi*. The form now present on the roots is shown magnified at Fig. 1, and may be described as follows:

APTEROUS VIVIPAROUS FEMALE.

Length . . . . 1.0 mm.
Width . . . . .4 mm.

Body, small, ovate. Color, dark bluish-green: head, yellowish or greenish; antennae, yellowish-brown toward base, darker apically; eyes, reddish; legs, yellowish or yellowish-brown, ex-

cept the tibio-femoral articulations and tarsi, which are dusky; cornicles, yellowish or yellowish-brown at base, darker apically; cauda varying from bluish-green to yellowish or yellowish-brown. Antennae about half as long as body, roughened, as shown at Fig. 2, six-jointed[1]; joints I and II sub-equal in length, I being slightly broader than II; III long, slightly longer than IV plus V, but a little shorter than VI; IV about half as long as III; V short, two-thirds as long as IV; VI longest. Cornicles long, slightly tapering, flanged at tip. Cauda prominent, flattened, with a number of curved hairs along the margin. Prothorax with a blunt tubercle on each side.

Described from many living specimens taken on roots of strawberry plants, 7 September, 1889.

[1] Although I agree with Forbes and Lichtenstein that what is here called the sixth joint of the antenna is really the prolongation of the fifth, I follow the general practice of calling it distinct for sake of brevity and convenience.

CLASSIFIED LIST OF FOOD PLANTS OF AMERICAN BUTTERFLIES, DRAWN FROM SCUDDER'S "BUTTERFLIES OF THE EASTERN UNITED STATES."

[Names followed by an * indicate the plants for which the species concerned have a decided preference. Those enclosed in parentheses are exceptional or doubtful.]

OENEIS SEMIDEA. *Cyperaceae*, Carex vulgaris var. hyperborea.

OENEIS JUTTA. *Cyperaceae*, Carex oligosperma;* *Gramineae*; (*Juncaceae*, Juncus articulatus).

CERCYONIS ALOPE. *Gramineae*.

CERCYONIS NEPHELE. *Gramineae*.

ENODIA PORTLANDIA. (*Urticaceae*, Celtis occidentalis); *Gramineae*.*

SATYRODES EURYDICE. *Cyperaceae*, Scirpus eriophorum, Carex bromoides; *Gramineae*.

NEONYMPHA PHOCION. *Gramineae*, Panicum sanguinale, Dactolytenium aegyptiacum.

CISSIA EURYTUS. *Leguminosae*, Trifolium; *Xyridaceae*, Xyris torta; *Gramineae*.*

CHLORIPPE CLYTON. *Rosaceae*, Prunus; *Aristolochiaceae*, Aristolochia; *Urticaceae*, Celtis occidentalis.*

BASILARCHIA ARCHIPPUS. *Rosaceae*, Prunus, Pirus, Chrysobalanus oblongifolius; *Salicaceae*,* Salix nigra, S. livida var. occidentalis, S. sericea, Populus balsamifera var. candicans, P. tremuloides, P. monilifera, P. dilatata.

BASILARCHIA ASTYANAX. *Rosaceae*,* Prunus, Pirus, Crataegus, Cydonia; *Grossulaceae*, Ribes; *Ericaceae*, Vaccinium stami-

neum; *Cupuliferae*, Carpinus americana, Quercus ilicifolia; *Salicaceae*, Salix, Populus.

BASILARCHIA ARTHEMIS. *Tiliaceae*, Tilia; *Rosaceae*, Crataegus, Amelanchier; *Caprifoliaceae; Urticaceae*, Ulmus; *Betulaceae*, Betula lenta;* *Salicaceae*, Populus balsamifera.

POLYGONIA INTERROGATIONIS. *Tiliaceae*, Tilia americana; *Urticaceae*, Ulmus americana,* Celtis occidentalis Urtica, Boehmeria cylindrica, Humulus lupulus,

POLYGONIA COMMA. (*Tiliaceae*, Tilia); *Grossulaceae*, Ribes; *Urticaceae*,* Humulus lupulus, Ulmus americana, Urtica, Boehmeria cylindrica.

POLYGONIA SATYRUS. *Ericaceae*. Azalea; *Urticaceae*,* Urtica.

POLYGONIA FAUNUS. *Grossulaceae*, Ribes; *Betulaceae*, Betula lenta;* *Salicaceae*, Salix humilis.

POLYGONIA GRACILIS. (Probably one of preceding or succeeding.)

POLYGONIA PROGNE. *Rosaceae*, Rubus; *Grossulaceae*,* Ribes rotundifolium, Ribesia; *Urticaceae*, Ulmus americana.

EUGONIA J-ALBUM. *Betulaceae*, Betula alba var. populifolia; (*Salicaceae*, Salix, Populus).

EUVANESSA ANTIOPA. *Rosaceae; Urticaceae*. Ulmus americana,* Celtis occidentalis; *Betulaceae*. Betula humilis; *Salicaceae*, Salix.* Populus candicans, P. dilatata.

In Europe: *Tiliaceae*, Tilia; *Betulaceae*, Betula humilis; *Salicaceae*, Salix.

AGLAIS MILBERTI. *Urticaceae*.* Urtica dioica, U. gracilis; (*Salicaceae*, Salix).

VANESSA ATALANTA. *Urticaceae*, Urtica.* Humulus lupulus. Boehmeria cylindrica, Parietaria debilis.

In Europe: *Urticaceae*, Urtica, Parietaria.

VANESSA HUNTERA. *Compositae*, Gnaphalium polycephalum,* G. purpureum,* Antennaria plantaginifolia,* Anaphalis margaritacea,* Helianthus, Senecio cineraria, Artemisia ludoviciana; *Borraginaceae*, Myosotis.

VANESSA CARDUI. *Malvaceae*, Althaea rosea; *Compositae*, Centaurea benedicta,* Cnicus lanceolatus,* C. arvenis,* Carduus nutans.* Silybum marianum, Onopordon acanthium, Arctium lappa, Senecio cineraria, Helianthus sp., Anaphalis margaritacea, Artemisia; *Borraginaceae*, Borrago officinalis; *Urticaceae*, Urtica.

In Europe: *Malvaceae*, Malva rotundifolia; *Compositae*, Carduus,* Cnicus,* Onopordon, Centaurea benedicta.* Cynara scolymas, Achillea millifolium, Gnaphalium arvense, Filago arvensis; *Borraginaceae*, Echium.

In Asia and Africa: *Compositae*, Artemisia, Blumea; *Malvaceae*,* Malva.

JUNONIA COENIA. *Onagraceae*, Ludwigia alternifolia; *Plantaginaceae*, Plantago lanceolata, P. virginica; *Scrophulariaceae*, Gerardia purpurea,* Linaria canadensis.

EUPTOIETA CLAUDIA. *Berberidaceae*, Podophyllum peltatum; *Violaceae*, Viola tricolor; *Portulacaceae*, Portulaca; *Leguminosae*, Desmodium paniculatum; *Passifloraceae*,* Passiflora incarnata, P. caerulea; *Grossulaceae*, Sedum;* *Borraginaceae*, Cynoglossum?

SPEYERIA IDALIA. *Violaceae*, Viola; (*Compositae*, Sericocarpus conyzoides).

ARGYNNIS CYBELE. *Violaceae*, Viola.

ARGYNNIS APHRODITE. *Violaceae*, Viola.

ARGYNNIS ATLANTIS. *Violaceae*, Viola.

BRENTHIS MYRINA. *Violaceae*.

BRENTHIS MONTINUS. (*Violaceae*; *Rosaceae*, Geum radiatum).

BRENTHIS BELLONA. *Violaceae*.

PHYCIODES THAROS. *Compositae*, Aster, A. novaeangliae,* (Actinomeris).

PHYCIODES BATESII. (*Compositae*).

CHARIDRYAS NYCTEIS. *Compositae*, Aster [Doellingeria] umbellatus, Rudbeckia laciniata, Helianthus divaricatus,* Actinomeris squarrosa,* Verbesina helianthoides.

CINCLIDIA HARRISII. *Compositae*, Aster [Doellingeria] umbellatus.

EUPHYDRYAS PHAETON. *Grossulaceae*, Ribesia; *Caprifoliaceae*, Lonicera ciliata,

Viburnum dentatum; *Plantaginaceae*, Plantago; *Scrophulariaceae*, Chelone glabra,* Mimulus ringens, Gerardia pedicularia.

ANOSIA PLEXIPPUS. *Apocynaceae*, Apocynum androsaemifolium; *Asclepiadaceae*, Asclepias cornuti,* A. purpurascens, A. incarnata, A. tuberosa, A. amplexicaulis, A. tomentosa, A. curassavica, A. nivea, Acerates.

HYPATUS BACHMANII. *Urticaceae*, Celtis occidentalis.

CALEPHELIS BOREALIS. Unknown.

STRYMON TITUS. *Rosaceae*, *Prunus*;* *Compositae*, Eupatorium coelestinum; *Cupuliferae*.

ERORA LAETA. Unknown.

INCISALIA NIPHON. *Leguminosae* (Lupinus perennis); *Coniferae*, Pinus,* (Juniperus).

INCISALIA IRUS. *Rosaceae*, Prunus;* *Leguminosae*, Lupinus perennis, Cercis canadensis; *Ericaceae*, Vaccinium corymbosum, Leucothoe racemosa, Cyrilla racemifolia; *Aquifoliaceae*, Ilex.

INCISALIA AUGUSTUS. Unknown.

URANOTES MELINUS. *Hypericaceae*, Hypericum; *Leguminosae*; *Rosaceae*, Crataegus coccinea, C. apiifolia; *Borraginaceae*, Cynoglossum officinale; *Urticaceae*, Humulus lupulus.*

MITURA DAMON. *Coniferae*, Juniperus virginiana;* *Smilaceae*, Smilax.

THECLA ONTARIO. Unknown.

THECLA LIPAROPS. *Rosaceae*,* Crataegus, Prunus, Amelanchier canadensis: *Ericaceae*, Vaccinium corymbosum; *Aquifoliaceae*, Ilex: *Cupuliferae*, Quercus, Castanea; *Salicaceae*, Salix.

THECLA CALANUS. (*Rosaceae*, Crataegus); *Juglandaceae*,* Juglans cinerea, Carya, C. glabra; *Cupuliferae*, Quercus rubra, Q. falcata.

THECLA EDWARDSII. *Cupuliferae*, Quercus.

THECLA ACADICA. *Salicaceae*, Salix.

EVERES COMYNTAS. *Leguminosae*, Lespedeza capitata, Phaseolus perennis, Desmodium marylandicum, Galactia, Trifolium.

CYANIRIS PSEUDARGIOLUS. *Ranunculaceae*, Cimicifuga racemosa;* *Cruciferae*, Rhus, (Nasturtium); *Rhamnaceae*, Ceanothus americanus, (Rhamnus carthartica); *Sapindaceae*, Aesculus californica; *Leguminosae*, Erythrina herbacea, Apios tuberosa, (Trifolium); *Rosaceae*, Spiraea salicifolia, (Amelanchier canadensis); *Cornaceae*, Cornus;* *Caprifoliaceae*, Viburnum acerifolium: *Compositae*, Verbesina helianthoides, Actinomeris squarrosa,* Dimorphantes mantchuricus; *Ericaceae*, Vaccinium, V. corymbosum; *Aquifoliaceae*, Ilex, (Begonia); (*Asclepiadaceae*, Asclepias; *Salicaceae*, Salix).

NOMIADES COUPERI. (*Leguminosae*, Vicia cracca.)

RUSTICUS SCUDDERII. (*Rhamnaceae*, Ceanothus); *Leguminosae*, Lupinus perennis.

CHRYSOPHANUS THOE. *Rutaceae*, Xanthoxylum; *Polygonaceae*, Polygonum, Rumex crispus.

EPIDEMIA EPIXANTHE. (*Gentianaceae*, Menyanthes trifoliata; *Polygoniaceae*, Persicaria, Rumex verticillatus; *Lauraceae*).

HEODES HYPOPHLAEAS. *Leguminosae*, Trifolium; *Polygoniaceae*, Rumex acetosella,* R. crispus.

FENISECA TARQUINIUS. Plant lice with clustering habit, especially *Schizoneura tessellata*.*

CALLIDRYAS EUBULE. *Leguminosae*, Cassia* marylandica, C. chamaecrista, C. occidentalis, C. tora, Trifolium.

XANTHIDIA NICIPPE. *Leguminosae*, Cassia* marylandica, C. occidentalis, C. tora, Trifolium.

EUREMA LISA. *Leguminosae*, Cassia chamaecrista,* C. occidentalis, C. nictitans, (Trifolium), Glycine.

EURYMUS INTERIOR. (*Leguminosae*, Desmodium; *Ericaceae*, Vaccinium).[1]

EURYMUS PHILODICE. *Leguminosae*, Trifolium* agrarium, T. repens, T. pratense, Baptisia tinctoria, Lupinus perennis, Medi-

[1] Mr. Fletcher writes that Bean has bred this species on Vaccinium and on Salix. (S. H. S.)

cago sativa, (M. denticulata), Astragalus caryocarpus, Pisum sativum, Vicia cracca, Cytisus, Caragana.

EURYMUS EURYTHEME. *Leguminosae*, Trifolium reflexum,* T. stoloniferum,* T. repens, T. tridentatum, Hosackia, (Astragalus caryocarpus, A. crotalariae).

ANTHOCHARIS GENUTIA. *Cruciferae*, Sisymbrium thaliana, Barbarea vulgaris, Arabis perfoliata, Cardamine, (Capsella bursa pastoris).

PONTIA PROTODICE. *Cruciferae*, Brassica oleracea,* Lepidium virginicum, Thlaspi, (Capsella bursa pastoris), Alyssum maritimum; *Resedaceae*, Reseda; *Compositae*, Erigeron; (*Solanaceae*, Solanum carolinense).

PIERIS OLERACEA. (*Ranunculaceae*, Caltha leptosepala); *Cruciferae*, Brassica rapa,* B. oleracea. Raphanus sativa, Nasturtium armoracia, Sinapis,* Arabis* drummondii, A. perfoliata, Barbarea vulgaris.

PIERIS RAPAE. *Cruciferae*, Brassica oleracea,* B. napa, Nasturtium armoracia, Raphanus, Sinapis, Matthiola, Alyssum maritimum, Nasturtium palustre, Barbarea vulgaris, Cakile americana; *Resedaceae*. Reseda odorata; (Geraniaceae, Tropaeolum).

In Europe: *Cruciferae*, Brassica, Sinapis, Nasturtium, Hesperis, Matthiola, Chieranthus, Erysimum, Lepidium, Raphanus; *Reseduceae*, Reseda; *Salicaceae*, Salix.

LAERTIAS PHILENOR. *Aristolochiaceae*, *Aristolochia** serpentaria, A. sipho, Asarum canadense; *Polygonaceae*, Polygonum (convolvulus).

IPHICLIDES AJAX. *Anonaceae*, Asimina triloba,* A. parviflora, A. grandiflora, A. pygmaea, Anona palustris; *Lauraceae*, Benzoin odoriferum; *Ericaceae*, Vaccinieae.

JASONIADES GLAUCUS. *Magnoliaceae*, Liriodendron tulipifera,* Magnolia acuminata; *Tiliaceae*, Tilia americana; *Rutaceae*, Ptelea trifoliata; (*Vitaceae*, Vitis); *Rosaceae*, Prunus, P. serotina, P. pennsylvanica, P. virginiana, P. americana, Pirus malus, Cydonia vulgaris, (Crataegus); *Styracaceae*, Styrax americana; *Bignoniaceae*, Catalpa bignonioides); *Oleaceae*, Fraxinus sambucifolia.* F. platycarpa, F. americana, F. trifoliata, Syringa vulgaris; *Lauraceae*, Sassafras officinale: *Urticaceae*, Humulus lupulus: *Juglandaceae*, Carya; *Cupuliferae*, Quercus tinctoria; *Betulaceae*, Betula* alba, B. lenta, Alnus incana; *Salicaceae*, Salix; Populus* tremuloides.

EUPHOEADES TROILUS. *Magnoliaceae*, Magnolia glaucus; *Rutaceae*, Xanthoxylum americanum; *Rosaceae*, Prunus serotina, P. persica, Pirus arbutifolia; (*Convolvulaceae*, Ipomaea batatas); *Oleaceae*, Syringa vulgaris; *Lauraceae*,* Benzoin odoriferum, Sassafras officinale; *Coniferae*, Juniperus sabiniana.

HERACLIDES CRESPHONTES. *Rutaceae*,* Citrus,* Ptelea trifoliata, Xanthoxylum americanum, X. clava-herculis, Dictamnus fraxinella; *Cornaceae*, Nyssa multiflora; *Lauraceae*, Persea carolinensis; *Salicaceae*, Populus dilatata; *Piperaceae*, Piper peltatum, P. umbellatum, P. mollicornum.

PAPILIO POLYXENES. *Rutaceae*, Dictamnus fraxinella; *Umbelliferae*, Daucus carota,* Hydrocotyle, H. umbellata, Conium maculatum, Cicuta maculata, C. virosa, C. bulbifera, Sium cicutaefolium, Apium* divaricatum, A. graveolens, Discopleura capillacea, Carum petroselinum, C. carui, Anethum graveolens, Foeniculum vulgare, Archangelica, Tiedemannia, T. teretifolia, Pastinaca sativa, (Arracia esculenta).

EUDAMUS PROTEUS. *Cruciferae*, Brassica; *Leguminosae*,* Wistaria frutescens, Desmodium viridiflorum, Phaseolus perennis, Clitoria mariana, C. ternatea.

EPARGYREUS TITYRUS *Leguminosae*, Amorpha fruticosa, Robinia pseudacacia, R. viscosa, R. hispida, R. neomexicana. Wistaria frutescens, Lespedeza capitata, Lathyrus paluster, Apios tuberosa, Desmodium marylandicum, D. nudiflorum, D. canadense, Amphicarpaea monoica, Gleditschia.

ACHALARUS LYCIDAS. (*Fumariaceae*, Corydalis glauca); *Leguminosae*, Desmo-

dium* dillenii, D. paniculatum, (Indigofera, Baptisia?); *Convolvulaceae*, Ipomaea pandurata.

THORYBES BATHYLLUS. *Leguminosae*, Rhynchosia tomentosa, Tephrosia ambigua, Centrosema virginianum, (Lespedeza hirta).

THORYBES PYLADES. *Leguminosae*, Trifolium* pratense, T. repens, Lespedeza capitata,* L. hirta, Desmodium dillenii.

THANAOS LUCILIUS. *Ranunculaceae*, Aquilegia canadensis;* (*Chenopodiaceae*, Chenopodium album).

THANAOS PERSIUS. *Salicaceae*, Salix humilis, Populus balsamifera, P. tremuloides, P. grandidentata.

THANAOS JUVENALIS. *Leguminosae*, Apios tuberosa, Lathyrus, Galactia pilosa, (G. glabella); *Cupuliferae*, Quercus* phellos, Q. ilicifolia, Q. alba, Corylus.

THANAOS HORATIUS. *Leguminosae*, Wistaria frutescens.

THANAOS TERENTIUS. (*Leguminosae; Cupuliferae.*)

THANAOS MARTIALIS. (*Rhamnaceae*, Ceanothus americanus); *Leguminosae*, Indigofera caroliniana; (*Haemodoraceae*, Lachnanthes tinctoria).

THANAOS AUSONIUS. (*Leguminosae?*).

THANAOS BRIZO. *Leguminosae*, Galactia glabella; *Cupuliferae*, Quercus ilicifolia.

THANAOS ICELUS. (*Leguminosae*, Baptisia?); *Hamamelaceae*, Hamamaelis; (*Cupuliferae*, Corylus); *Salicaceae*, Populus tremuloides, (Salix cordata).

PHOLISORA CATULLUS. (*Compositae*, Ambrosia); *Labiatae*, Monarda punctata, Origanum vulgare; *Chenopodiaceae*, Chenopodium album;* *Amarantaceae*,* Amarantus albus.

HESPERIA MONTIVAGA. *Malvaceae*, Sida, Althaea, Malva, Abutilon avicennae.

HESPERIA CENTAUREAE. (*Labiatae*, Mentha?)

ANCYLOXIPHA NUMITOR. *Gramineae.*

PAMPHILA MANDAN. *Gramineae*, Panicum crus galli, P. sanguinale, Triticum repens.

AMBLYSCIRTES VIALIS. *Gramineae*, Poa pratensis.

AMBLYSCIRTES SAMOSET. *Gramineae.*

POANES MASSASOIT. (*Gramineae.*)

PHYCANASSA VIATOR. (*Gramineae.*)

ATRYTONE LOGAN. *Gramineae*, Erianthus alopecuroides.

ATRYTONE ZABULON. *Gramineae.*

HYLEPHILA PHYLAEUS. *Gramineae*, Panicum sanguinale.

ERYNNIS SASSACUS. *Gramineae*, Panicum sanguinale.

ERYNNIS MANITOBA. (*Gramineae.*)

ERYNNIS METEA. *Gramineae.*

ERYNNIS ATTALUS. (*Gramineae.*)

ATALOPEDES HURON. *Gramineae*, Cynodon dactylon.

ANTHOMASTER LEONARDUS. *Gramineae.*

POLITES PECKIUS. (*Gramineae.*)

THYMELICUS AETNA. (*Gentianaceae*, Sabbatia gracilis, S. elliottii); *Gramineae*, Panicum sanguinale.

THYMELICUS BRETTUS. *Gramineae*, Paspalum ciliatifolium.

THYMELICUS MYSTIC. *Gramineae.*

LIMOCHORES BIMACULA. (*Gramineae.*)

LIMOCHORES MANATAAQUA. *Gramineae.*

LIMOCHORES TAUMAS. *Gramineae.*

LIMOCHORES PONTIAC. (*Gramineae.*)

EUPHYES METACOMET. (*Gramineae.*)

EUPHYES VERNA. (*Gramineae.*)

CALPODES ETHLIUS. *Cannaceae*, Canna flaccida, C. indica.

OLIGORIA MACULATA. (*Gramineae.*)

LEREMA ACCIUS. (*Leguminosae*, Wistaria frutescens); *Gramineae*, Zea mays, Erianthus alopecuroides.

LEREMA HIANA. (*Gramineae.*)

PARASITISM OF HIPPODAMIA CONVERGENS. —On page 188 of the present volume of *Psyche* is an article by C. M. Weed and C. A. Hart in which is recorded their observations on the lady-beetle parasite (*Perilitus americanus*), an account of which was first given by Dr. C. V. Riley on page 101 of volume 1 of *Insect life*. All of the observations referred to in these articles speak of this parasite as attacking *Megilla maculata* except in one instance where Dr. Riley speaks of one specimen of *C. 9-notata* which was probably attacked by the same parasite. I wish to add *H. convergens* to the list, a single specimen of which I took on the 17th of August, 1889, from a corn leaf where it was standing dead, over a little brown cocoon exactly as *M. maculata* is represented in *Insect life*. The parasite had escaped when the discovery was made.

This has been the most common lady-beetle at Ames, Iowa, the past summer wherever plant lice have been abundant.

C. P. Gillette.

EMPHYTUS CINCTUS IN AMERICA. — Late in the autumn of 1887 I found a large number of sawfly larvae, not before observed, on the under side of leaves of several species of rose bushes at the Arnold Arboretum and one or two other places in the vicinity of Boston. Early in 1888 two or three sawflies emerged from some larvae which had been kept in confinement from the previous autumn, but being forgotten little more than the wings were found. The larvae were again plentiful in 1888 and about 15 Sept. I succeeded in raising several perfect sawflies. These I was unable to determine or to get determined for me. The past summer I raised one or two more from larvae and captured a number of the sawflies as they were flying about rose bushes. Unable to find any American species to correspond with these, I referred to descriptions of European species and have been able to identify my specimens beyond doubt as *Emphytus cinctus* L. a species common in England and on the Continent. These American specimens also agree in all particulars with European specimens in the Museum of comparative zoology at Cambridge.

J. G. Jack.

POWER OF VISION IN VESPIDAE. — One day in the middle of July, while confined by illness to my tent on the summit of the Roan Mountains, Col., I was able to watch at leisure the operations of a couple of wasps which had entered the tent and were searching for flies along the tent roof. The tent was an ordinary wall tent, 10 ft. × 12 ft., where, lying upon his back, the observer might readily follow all the movements of these creatures. There were also in the tent perhaps a dozen or twenty flies, mostly collected near the ridge pole, especially, when not in flight, alighting upon a rope which stretched from one of the upright poles supporting the tent to the other, just below the ridge pole. The wasps were in incessant motion, and in the course of one morning were seen to capture only three or four flies, the flies usually being able to dodge them whenever an attack upon them was made. I was unable to see that a wasp accelerated its motion in the least when approaching the flies or directed its flight immediately upon them until within two or three inches of its intended victim; and as it often passed one by at no greater distance than this without any attempt at capture, the impression was strong that the wasp's distinct vision while in flight did not exceed this distance. But what was most surprising was the great number of mistakes made by the wasps. Every slight stain or defect in the canvas or minute shadow upon it was repeatedly attacked by the wasps as if they supposed it to be a suitable object for food. There seemed to be no power on their part of distinguishing between a spot of color upon the canvas having no elevation whatever and an object or body resting upon it. Several times the shadow made by a fly

alighted upon the outside of the tent was pounced upon by the wasps on the inside, and such objects, mere shadows or stains, were repeatedly attacked by the same wasp over and over again, often with only half a minute's interval or even less than that. I can not now recollect exactly the estimate I made at the time (but failed to record) of the relative number of attacks upon false objects to those upon proper victims, but I am under the impression that the mistakes were to the correct judgments as twenty or thirty to one. My observations were continued for two or three hours and repeated on subsequent days for briefer times, always with an identical result. These observations seem to be entirely in keeping with the forced experiments of Professor Plateau upon the vision of wasps, and lead to the conclusion formulated by him that the vision of these insects, even when in flight, is exceedingly defective, judged by our own standards.

Samuel H. Scudder.

SECOND BROOD OF CALLOSAMIA PROMETHEA.—Last May and June a large number of *Callosamia promethea* emerged in my house and mated. From these I obtained a brood of larvae some weeks in advance of those to be found out of doors. These pupated in June and July, and, to my surprise, I raised a second small brood of more than a dozen specimens before the 20th of August. Some of these hatched at a normal summer temperature, others in the sun, or near a fire. The greater part of them were males. The two sexes paired readily. On the 20th and 21st respectively I found a large male hovering about the cage in which my females were kept. It would be interesting to know whether these free males belonged to another brood or had hatched from cocoons made by escaped members of the same brood to which my females belonged, as this would go far toward settling the question of an occasional second brood under natural conditions in this species.

The eggs laid by my females began to hatch 4 September and at first ate well and seemed to be thriving; but by the 28th most of them had succumbed, either to some innate weakness, or to the unusual dampness which caused such mortality amongst larvae during the summer of 1889.

Holmes Hinkley.

NOTES ON EMESA LONGIPES, De Geer.—This interesting insect has been very abundant in Central Ohio during the past summer, occurring especially in a row of Norway spruces on the university grounds, where we have collected great numbers by beating. I kept a number alive in the insectary, and obtained many of the eggs, which I believe have never been described.

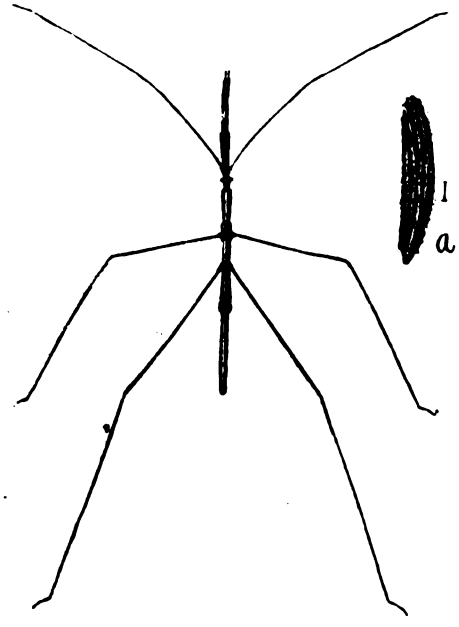
Besides the trees above mentioned these bugs were frequently obtained in miscellaneous beatings in the woods, and occasionally occurred in numbers in carriage sheds.

The only observation upon their feeding habits I am able to record was made by an assistant, Mr. F. W. Rane, who found one in a shed devouring a small white moth, possibly *Spilosoma virginica*, grasping its victim by its strong front legs.

This *Emesa*, with its exceedingly long legs and body, and small wings, seems poorly prepared for flying, and as a matter of fact it is very difficult to get one to fly by disturbing it. That they do so voluntarily, however, was shown by their being taken on the wing in the middle of a field. In the Proceedings of the Boston society of natural history v. 14, p. 391, Dr. Hagen states that the eggs are of an elongated, conical form.

The only other mention of the eggs I have found is the following sentence by Mr. Uhler in the Standard natural history (v. 2, p. 277): "We do not yet know where it deposits the eggs; but from analogy we are led to believe that these are glued to the twigs of bushes and trees, just as is the case with many others of the great group to which this species belongs."

I obtained the eggs a number of times during the month of September. They were from confined females, deposited on the sides of the breeding cage, apparently being glued to the wood. They are black, 2.5 to 3 mm. long, subcylindrical in shape, with numerous longitudinal ridges having jagged edges. At the lower end is a distinct flange, inside of which is a circular depression, from which arises a conical projection as shown at *a* in the accompanying illustration.



These eggs are probably glued to the bark of trees, especially evergreens, as surmised by Mr. Uhler, and apparently this is the state in which the species passes the winter.

I am indebted to my assistant, Miss Freda Detmers, for the drawings from which the accompanying figures have been reproduced.

Clarence Moores Weed.

DESCRIPTION OF THE LARVA OF OSMODERMA SCABRA, BEAUV.—COLOR. Head testaceous, mandibles piceous; body sordid white, becoming semi-translucent toward the posterior portion, showing the color of the contents of the body; covered sparsely but regularly with reddish-brown hairs; on each side of the first segment is a corneous testaceous patch; spiracles and extremities of the thoracic feet also testaceous.

HEAD sub-ovate, slightly rugose, shiny posterior portion and sides well rounded; anterior portion angulated and somewhat truncate.

CLYPEUS transversly oblong, sides oblique, broader than long.

LABRUM rugose, rounded at the sides and front, a little broader than the clypeus, but not as long.

ANTENNÆ four jointed; first joint cylindrical, swollen at the apex; second and third joints about half as long as the first, also swollen at the apex; fourth joint conical, and about as long as the first.

MANDIBLES stout, quadridentate, at the apex, excavate internally, base prominent with three broad blunt teeth.

MAXILLÆ prominent, rather stout, not extending beyond the mandibles; lobe subcylindrical, with a sharp bristle at the apex.

MAXILLARY PALPI extending beyond the lobe, three jointed; first and second joints subglobose, terminal joint longer, conical.

LABIUM subquadrate, somewhat broader than long.

LABIAL PALPI, two jointed, first joint cylindrical, second joint longer, conical.

BODY curved, stout; rounded above and flattened beneath, with numerous transverse wrinkles, except on the last segment which is smooth.

LENGTH about 35 mm. WIDTH about 15 mm. Lives socially in decaying wood of sweet gum (*Liquidambar*), hickory (*Carya*), poplar (*Populus*), willow (*Salix*), sycamore (*Plantanus*), sassafras (*Sassafras*), maple (*Acer*), oak (*Quercus*), and chestnut (*Castanea*).

William Beutenmüller.

PROCEEDINGS OF SOCIETIES.

CAMBRIDGE ENTOMOLOGICAL CLUB.

(*Continued from p. 153.*)

8 APRIL 1887. — The 128th meeting was held at 156 Brattle St., Cambridge, on Friday, 8 April, 1887. The president, Mr. J. H: Emerton in the chair.

In the absence of a quorum no business was transacted.

Mr. C. W. Woodworth showed photographs representing the venation of the wings of various coleoptera. The venation of the wings of the *adephaga* differs from that which pertains in the other coleoptera, with the exception of the *cupesidae*. Mr. Woodworth has devoted considerable time to this subject and says that he has had no difficulty in recognizing some of the families of the order by means of the venation of their wings. The result which will probably be obtained from his study promise to be of considerable value.

Mr. S H. Scudder spoke of the importance of such a method of separation in the determination of the fossil forms of coleoptera, as in many cases the wings are the only parts well preserved.

Mr. Woodworth then stated that he has found another difference between the *adephaga* and the lower coleoptera. The ovarioles of the former series belong to the same type as those of the hymenoptera, diptera, lepidoptera and neuroptera, while a different type is found in the rest of the order and in all other insects, with the exception of the viviparous *aphidae*, the ovarioles of which, although said to resemble those of the hymenoptera, etc., appear rather to be intermediate between the two types above indicated.

Mr. Scudder showed his collection of American and European caterpillars.

Mr. Woodworth stated that he believed the color of the larvae of *Papilio troilus* to be protective.

Mr. Scudder presented the skeleton of *Physeter macrocephalus* in the Museum, June 1886.

and remarked on the probable identity of this species and *P. tharos*.

Mr. R. Hayward showed specimens of *Aphodius pumilus*, from New Mexico, a species described by Dr. Horn in a monograph of the genus now in press. Mr. Hayward's specimens are from the valley of the Rio Animas. He also showed specimens of our two species of *Amphizoa* (*A. insolens* Lec. and *A. lecontei* Matth.) and remarked on the differences between them.

13 MAY 1887.—The 129th meeting was held at 61 Sacramento St., Cambridge, 13 May 1887; The president, Mr. J: H. Emerton in the chair.

Mr. S: H. Scudder showed an egg of *Thecla strigosa* collected at Turkey Hill, Arlington, and also a drawing of it by Mr. Emerton. The egg was protected in a curious way by threads which fastened it to the twig on which it was laid.

Mr. R. Hayward exhibited specimens of various North American species of *Nebria*, and remarked briefly on the habit of *N. purpurata* and *N. trifaria* as observed by him in Colorado.

Mr. C: W: Woodworth exhibited a collection of *phalangidae* from Illinois.

10 JUNE 1887.—The 130th meeting was held at 61 Sacramento St., Cambridge, and was called to order by the president. Mr. J. H: Emerton.

Mr. J. H: Emerton showed some parasites of spiders in their various stages, which he had taken near Roberts Station, Waltham. From one of these parasites the hymenopterous imago had been obtained. See *Insect Life*, v. 1, p. 106-107.

14 OCTOBER 1887.—The 131st meeting was held at 61 Sacramento Street, Cambridge: the president, Mr. J. H. Emerton in the chair. The publication of PSYCHE was discussed at some length.

11 NOVEMBER 1887.—The 132nd meeting was held at 61 Sacramento St. Cambridge. In the absence of the president, Mr. George Dimmock was chosen chairman.

Nominations for the [illegible] Mr. W. S. Wids-

worth, of Cambridge, for active membership, was presented by Messrs. C. W. Woodworth and G: Dimmock.

The chair appointed Messrs. S: H. Scudder, J. H: Emerton, R. Hayward, C: W: Woodworth and G: Dimmock a committee to consider the feasibility of publishing PSYCHE.

Mr. C: W: Woodworth remarked on two larvae he had observed.

Mr. R. Hayward showed a specimen of *Erebus odora* from Lower California.

Mr. Dimmock spoke of a cocoon of a lepidopterous larva he had observed, which was made entirely of human hair.

9 DECEMBER 1887.—The 133rd meeting was held at 61 Sacramento St., Cambridge. The president, Mr. J. H: Emerton, in the chair.

The report of the committee appointed at the last meeting to consider the feasibility of continuing the publication of PSYCHE was presented by Mr. S: H. Scudder, chairman of the committee. The report was accepted and in accordance with the recommendations of the committee it was voted to begin a new volume with 1888.

Mr. S: H. Scudder read a letter from Miss Adele M. Fielde, and exhibited, among other specimens sent him by that lady from China, two specimens of a grasshopper (*Conocephalus acuminatus*), the chirp of which, as Miss Fielde aptly expresses it, "makes the heat audible."

Mr. Scudder showed some larvae and pupae of *Pieris rapae* which he has kept in a half and half mixture of glycerine and water since 1871. They still retained their color.

Mr. Holmes Hinkley showed some specimens of spiders which he had taken from the cells of a mud-wasp.

Mr. J. H: Emerton showed a specimen of *Lycosa kochii* which makes a noise by drumming on the leaves. The species lives amongst dead leaves in the woods and the drumming is supposed to be done with the palpi. The specimen in question was from Staten Island and was collected by Mr. W. T. Davis who would publish his observations in the Proc. Nat. hist. assoc. of Staten Island Mr. Emerton said that he did not know of the occurrence of this spider in this vicinity.

Mr. J. W. Folsom stated that he had observed this spider near Arlington.

Mr. G: Dimmock showed a Swiss spider which had bitten him, causing considerable poisoning.

Mr. Emerton identified it as a species of *Tegenaria*. Mr. Emerton then examined the spiders shown by Mr. Hinkley and found amongst them several species, the majority being young *Epeira*. He remarked that spiders stored in the nests of mud-wasps remain pliable for some time.

Mr. C: W: Woodworth remarked that he had known instances where one of the spiders had recovered and devoured the rest.

Mr. Hinkley stated that he had examined the larvae of some *smerinthi* and observed the ichneumon larva feeding under the skin, and in a few hours the pupa was found on the outside. He then asked how this was brought about.

In answer to the inquiry, Mr. S: H. Scudder stated that the larva emerges and forms its cocoon on the outside in a very short time.

Mr. Woodworth asked what effect the warm weather would have upon insect life.

Mr. S: Henshaw showed a piece of bed ticking with a felting produced by *Attagenus megatoma*. The larva gnaws the feathers, forming a fine dust, and the felting is stated by Prof. C: V. Riley to be due to the mere mechanical process of beating and shaking.

COLORADO BIOLOGICAL ASSOCIATION.

(*Continued from p. 228.*)

REPORT ON ENTOMOLOGY—APRIL 1889. — The membership now numbers 61; two entomologists have become members during the month, Miss Emily L. Morton and Prof. James Cassidy. Four coleoptera, 749 hymenoptera, and a fossil thysanuran have been added to our Colorado list. The very numerous additions in hymenoptera are derived from a full list of the Colorado

species drawn up with great care and labor by Mr. W: H. Ashmead, and now waiting publication.

A short 13th Report has been published, containing a figure of the "wound-gnat." Dr. John Hamilton has examined a small collection of Custer co. coleoptera, and finds therein a probably undescribed species of *gyrinus*. Mr. W: H. Ashmead has reported on some Custer co. hymenoptera, five of which are new species, one *Vibrio coloradensis* Ashm. being the first of its genus detected in the United States. In Wet Mountain valley, *Pyrameis cardui* has been out in great force; and contrary to all expectations, *Colias eurytheme* var. *intermedia* appeared on 28 April. Last year no orange forms appeared in the early spring, all were *autumnalis*. *Photopsis alcanor* Blake has appeared at light: this is a spring species in Wet Mountain Valley, being wholly supplanted by *P. glabrella* Cr. later in the year. An empty *Smerinthus* egg found on a willow leaf at West Cliff has aroused some curiosity, as *S. astarte*, the only known species in the district, was believed to feed on *Populus*. A larva of *Hipparchia ridingsii* was found hibernating under a rock in Custer co., and sent to Mr. W: H. Edwards, who reports it to be in good health, and it will no doubt form material for one of Mr. Edwards's admirable life-histories.

Report on Entomology—May, 1889.—The recent election of officers and council has resulted as follows: *president:* C. F. Morrison, *sec'y:* T. D. A. Cockerell, *treas.:* H. G. Smith, Jr., *council:* C. H. Merriam, H. W. Nash, A. S. Packard, D. Gale, D. W. Park, and J. M. Coulter. The membership is now 65; two entomologists, Messrs. L. O. Howard and J. W. Tutt have joined during the month. The additions to the Colorado insect-fauna for May are rhopalocera, 1 var.; heterocera, 6 and 1 var.; homoptera, 1; and diptera, 3.

A good deal of work has been done which cannot now be reported on fully. Galls collected at West Cliff have produced an abundance of hymenoptera and diptera, which will form material for an extensive account in the future. Galls of *Rhodites bicolor* Harr. have been especially prolific in chalcid parasites, as also have those of *Cecidomyia salicis-strobiloïdes* O.—S. Small flat leaf-galls on rose have produced *Rhodites rosaefolii* n. sp., as well as some chalcids.

An interesting *Trypeta* has been bred from woolly galls on *Bigelovia*. The sawfly reared from a larva, about 20 mm. long, light bluish green marked with yellow patches and black spots, found on willow in West Mountain Valley last year, has been indentified as a new species of *Messa* by Mr. Ashmead, and both imago and larva will be described fully hereafter as *M. salicum* n. sp. Among diptera, *gonia exul* Willist. was found at West Cliff 16 May, and 25 May, the curious pupae of a species of *Microdon* were found in a nest of *Formica integra* at the same place. A probably new species of *Orthezia* has turned up in an ant's nest in Custer co.—but of this more hereafter. Mr. H. G. Smith Jr., has sent specimens of *Phyllotreta pusilla* Horn (= *albionica* auct., non Lec.) from Denver, where they are injurious to the cultivated cruciferae. *Pyractomena borealis* appeared at West Cliff on May 26. It was found that the light of this beetle could be intensified at will by gently pressing the thorax and fore part of the abdomen between the finger and thumb. *Pamphila uncas* (kindly indentified by Mr. W. H. Edwards), was found abundantly on a dry beach above Grape Creek in Custer co., visiting the flowers of *Senecio* and *Erysinum*. Mr. H: Edwards has identified a new species of *Aegeria* from Custer co., which he will describe later.

T. D. A. Cockerell (*Secretary*).

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CONTENTS:

ADVERTISEMENTS 286
THE WORK OF A DECADE UPON FOSSIL INSECTS, 1880–1889.—*Samuel Hubbard Scudder* 287–295
THE AMERICAN PLUM BORER, EUZOPHERA SEMI-FUNERALIS, WALK.—*Stephen Alfred Forbes* 295–299
DESCRIPTIONS OF SOME NEW NORTH AMERICAN MOTHS.— *William Beutenmüller* 299–300
ENTOMOLOGICAL SOCIETY OF LONDON 300

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PSYCHE.

THE WORK OF A DECADE UPON FOSSIL INSECTS, 1880–1889.

BY SAMUEL HUBBARD SCUDDER, CAMBRIDGE, MASS.

[Annual address of the retiring president of the Cambridge Entomological Club, 10 Jan. 1890.]

Some years ago I published an annotated and tolerably complete list of papers on fossil insects. It contained nearly three times as many titles as were referred to by Hagen in his entomological bibliography nearly twenty years previously, but, as the multiplication of periodical literature had brought in a train of minor papers, largely abstracts and compilations, I remarked that the far greater extent of my list was no proof of an increased recent interest in this field of research, but thought it doubtful whether in the intervening period there had been as much activity as when the works of Heer were opening the wealth of material at hand.

So marked a change has now come about in this respect that I venture this evening to invite your attention to a review of the advance that has been made during the past ten years in this previously neglected field. In doing this I do not by any means propose to cite every paper that has been published, but only to call your attention to the more important or interesting, from whatever cause, and thus endeavor to picture our progress as vividly as possible. Indeed, the mere list of authors would be wearisome, for one could make a catalogue of the writings of the last ten years considerably longer than the entire list given by Hagen in 1863. To be precise, I can cite 94 authors and about 225 papers published in this decade, against 78 authors and about 140 papers quoted by Hagen. Or to picture it in another way, about one third of a complete catalogue of papers on fossil insects would belong to the decade just closed. Nor is the bulk of this literature its only value; it is quite as remarkable for its quality, for by far the most important of the discoveries yet made in fossil insects are embodied in the researches of the last ten years, and there is no reason to suppose that we have reached their conclusion.

Note, first, the relatively great number of striking discoveries that have been made within this period. The discovery and careful study of Silurian scorpions in several different parts of

the world,—in Sweden by Thorell and Lindström, in Scotland by Peach and Hunter, and in New York by Whitfield, all brought out at very nearly the same time, are unprecedented in the annals of this division of science. These were followed almost immediately by Brongniart's surprising discovery of one of the hexapods, *Palaeoblattina*, in the Silurian of France, still the only known true insect in this ancient deposit. Coming down a stage later we have the remarkable Devonian insect-fauna of New Brunswick, about the nature of which there has been so much dispute, first announced, it is true, before our period, but only fully published with figures of the species in 1880; a single addition or two has recently been made to them by Matthew. With them must be classed the Devonian myriopods, the earliest known members of that group, fully elaborated by Peach. In the carboniferous period we have the striking wealth of forms from Mazon Creek and other deposits in our country which I have described at various times, including so extraordinary a number of blattarians that I have ventured to call this period, so far as its insect-fauna is concerned, "the age of cockroaches." These discoveries, largely due in this country to the activity and zeal of Mr. Lacoe, have been even more than paralleled by the unexampled wealth rightly claimed for Commentry in France by Brongniart, who as yet has published hardly more than an outline sketch to whet the appetite of the zealot. At this place are found, as Mr. Brongniart informs me in a recent letter, a considerable number of types already signalized in America, which indeed we had a right to anticipate by the comparisons that had been made between the forms already published from other localities in the two countries, new discoveries on one continent having repeatedly been followed sooner or later by very similar finds on the other. The abundance of cockroaches in both countries is fully sustained at Commentry, which has yielded the vast number of nearly six hundred specimens, or many more than are known from all other carboniferous localities in the world taken together. Still another striking discovery in the carboniferous rocks is the recent finding in Silesia of coleoptera, the first time that these have been signalized at this early epoch, but their description is yet to come.

These are the principal larger discoveries in the paleozoic series, but they have been accompanied by the publication of many striking forms which indicate the ancestral types of living insects, or by the better elucidation of types already known but whose significance had not been understood. To specify some of these we may mention *Palaeocampa* and *Acantherpestes* among the myriapods, the former with the curious and highly developed structure of the spinous hairs, the latter with its possession of segmental organs or branchial supports as well as stigmata, indicating a probable amphibious habit; *Anthracomartus*, *Kreischeria*, and *Geralinura*, the two former examples

of new extinct family types of arachnids, the last the first instance of the discovery of the *pedipalpi* earlier than the tertiaries, and found at brief intervals on two continents; other than this last of Kuśta's striking discoveries in the Bohemian coal field might well be cited; the gigantic ephemerid, *Palingenia*, of Bohemia; *Dasyleptus*, an extraordinary form of thysanura, a group not previously known earlier than the tertiaries; *Corydaloides*, like the preceding, one of Brongniart's discoveries at Commentry, remarkable for the extensive display of branchiae on the sides of the abdomen; *Petrablattina subtilis* of Kliver (Strephocladus) with its strange neuration; *Brodia* of England with its remarkable coloration; the gigantic *Titanophasma*, also from Commentry; the nymph of *Etoblattina* Woodward has published from England, showing the same mode of development among the ancient as the modern cockroaches; and, finally, *Phthanocoris*, the only hemipteroid type yet found in our own paleozoic rocks.

All these memoranda relate to the insects of the older formations only, but the statements regarding them in no proper way indicate the immense strides we have made in our knowledge of the earlier types. The decade has been marked not only by extensive and striking additions to known types, far more than doubling the number that had been previously published; it has witnessed also the advent of many original workers previously wholly unknown in this field, such as Beecher, Deichmüller, Karsch, Kliver, Kuśta, Matthew, Peach, Sterzel, Thorell, and Whitfield; but it has also seen the beginning of a new epoch in the study of the earlier types, in that for the first time the subjects have been treated in much more than a scattered way, by fuller discussions of the systematic status of the insects described, by attempts to systematize our knowledge, and by the treatment in single groups of insects from various or from all deposits, and not alone in the simple discussion of collections from a given deposit. Let us hope that the constantly increasing material and our larger knowledge may permit in a new decade a further correlation, by the comparative study of insects of different horizons, especially in the carboniferous age.

Previous to the last decade there had been scarcely a single attempt at the systematic study of all the older insects, or even of any of the minor groups found in the paleozoic rocks. Hagen, indeed, had treated briefly of the few *termitina* known over thirty years ago; Heer had attempted a grouping of the cockroaches; and Goldenberg had summarized our knowledge of all by an attempted classification; but besides these I do not recall a single instance where any serious attempt had been made to collate in a broad way our knowledge of paleozoic insects as a whole or in any of the parts. Only because it has so happened that the present speaker has been perhaps the most active worker in this narrow field during the last decade, is he obliged here to mention mainly his own work, since

it has fallen to his lot, in however imperfect a way, to attempt a more or less monographic treatment of the extinct type of *archipolypoda*, for instance, comprising most of the paleozoic myriopoda; of the paleozoic arachnida as a whole, in which he had been preceded by this decade by Karsch, working on much slenderer material and therefore at much smaller advantage; also on the paleozoic cockroaches, and on the species of *Mylacris*, a genus of cockroaches known from several American deposits; and on the genera allied to *Dictyoneura*, regarded as ancient types of *phasmida*. Reference should here also be made to Peach's careful work on the carboniferous arachnida of Scotland. In my memoir on the cockroaches, embracing the discussion of fifty-eight species referred to eleven genera, it was claimed that their differences from modern types were so fundamental as to warrant their separation from all subsequent and from living cockroaches as a distinct and equivalent group, called *palaeoblattariae*, and that they could be further separated into two divisions, called respectively *mylacridae* and *blattinariae*, of which the former was confined to the New World. Brauer has since questioned the value of the *palaeoblattariae* as a group, and Brongniart has recently stated that in the enormous crowd of cockroaches found at Commentry, the *mylacridae* are as numerous as the *blattinariae*, which probably means that the fauna of Commentry is older than that of the other carboniferous deposits of Europe and synchronous or nearly so with most of the cockroach-yielding deposits of America.

Both Brongniart and myself have also attempted new classifications of the paleozoic hexapods as a whole, which differ considerably in character, but which cannot yet fairly be compared; first because mine discusses nearly all the known types, but includes hardly any of those found at Commentry, then almost wholly unknown, while Brongniart, writing later, confines himself almost entirely to those of Commentry, with only an occasional allusion to previously described types; but principally because Brongniart's work is, so far, the merest sketch with hardly any structural details, a forerunner of what he will soon publish *in extenso* concerning this wonderful fauna, while mine contains full structural details as a basis for discussion and generalization. In it I have endeavored to point out that the existing orders of insects were not differentiated in paleozoic times except in a feeble way, prophetic as it were of the future, so that the Palaeodictyoptera, as, after Dohrn and Goldenberg, but with an extension of their usage, I had classed for the first time all known paleozoic insects, could only be separated into neuropteroid, orthopteroid and hemipteroid groups. These views, which I urged also in a special paper showing the development of the insect-type in time, have been so strenuously opposed by Brauer and others, that their further discussion can hardly be profitable except for those who have an unfortunate

taste for polemics, at least until the fauna of Commentry, which will certainly double the field of observation, gives us a fairer basis for judgment. Meanwhile it may be said that Brongniart in his sketch hints by many of his terms that he has found the same difficulties as those which faced me, and has been forced to admit a synthesis of structure in at least some of the older types, which indeed the very laws of evolution would render probable.

At the beginning of this decade our knowledge of mesozoic insects was very limited; it was almost entirely confined to the researches of Germar, Giebel, Hagen and Weyenbergh on the Jura of Eichstätt and Solenhofen; to Heer's account of the Liassic insects of Aargau; and to Brodie's and Westwood's publications on the secondary insects of England. The horizon has been somewhat extended of late years by the thorough discussion of the Bavarian insects by Deichmüller and by Oppenheim; by the careful exploitation of a new locality for Liassic insects at Dobbertin, Germany, by F. E. Geinitz; by the considerable number of new generic and specific types of cockroaches from the secondary rocks of England described by myself; by the repeated, though not extensive, discoveries of Fritsch in Bohemia, adding interesting material for our very meagre knowledge of cretaceous insects; and by the discovery at Fairplay, Col., of a collection of triassic cockroaches of special interest and importance.

Among noteworthy contributions to our knowledge of the insects of this epoch may be mentioned Oppenheim's study of the group he called *rhipidorhabdi*, which he regarded as a distinct order and an ancestral type of lepidoptera. The discussion of the structure of these insects, especially by Oppenheim and Deichmüller, has made clear many points regarding the Solenhofen insects which have always been obscure, and brought about the agreement that the *rhipidorhabdi* must be regarded as hymenoptera and in no sense predecessors of lepidoptera. Geinitz in his study of the Liassic fauna of Dobbertin has been able to extend considerably our knowledge of the structure of that prevailing mesozoic type, *Orthophlebia*, known entirely by its wings, and which he regards as phryganideous. In our own country, the triassic cockroach-fauna of Fairplay, just referred to, shows an interesting transition from the older to the newer forms, which goes far to substantiate the differences I have pointed out between paleozoic and later cockroaches; while the study of a large number of specimens of *Mormolucoides*, long but imperfectly known from the red sandstone of Connecticut, has enabled me to render it in a high degree probable that this oldest known insect-larva was a sialid.

In the monographic treatment of mesozoic insects we have only to record the discussion of the *rhipidorhabdi* already mentioned, and a systematic revision of the mesozoic cockroaches, based on a considerable collection of English forms new and old, lent me by

that veteran in their study the Rev. P. B. Brodie, a work which included more than seventy-five species, treated after the method employed in the revision of the paleozoic forms. The publication of both these memoirs on the ancient cockroaches, it may fairly be remarked, has since brought to light many more new forms, so that during the past decade there have actually been added to the number of pretertiary forms over a hundred species of cockroaches, about equally divided between paleozoic (53) and mesozoic (57) times. A general account of fossil cockroaches based on these data was given in my "Cockroach of the Past," in Miall and Denny's "Structure and life history of the cockroach" (London, 1886).

Passing now to tertiary times, we naturally cannot expect to meet with discoveries of equal importance and interest to those which throw light upon the origin of insect-forms, for it is a well known fact that the earliest tertiary insects are to all general intents and purposes identical with those of to-day. They differ no doubt specifically, and even to a considerable degree generically. Most of those so far recovered from temperate regions indicate a then warmer climate, but, taken as a whole, the grand features of insect-life appear to have been essentially the same since the beginning of tertiary times. By our present researches upon them we no doubt greatly widen our horizon, and as with modern types there always are found problems of interest, so will there be with fossil insects, however recent.

Activity in this field can hardly be said to be relatively so great as in the others, nor so great indeed as some time ago when Heer and Heyden were publishing extensively, but it nevertheless has not been insignificant, and it is noteworthy that more special work with groups has been undertaken; thus Buckton has summarized our knowledge of the fossil aphides, Schlechtendahl has elaborated the *psysopoda* of Rott, Gourret the arachnida of Aix, Hagen and Kolbe the *psocidae* of amber, and I the *termitina* of Florissant. I might also add the butterflies of Florissant, as my paper, though not yet published, has been months in type, and the general results were given in a brief paper on "Fossil butterflies" in general, in my "Butterflies of New England." Akin to these can only be mentioned the paper by Flach on the pleistocene coleoptera of Hösbach, Schlechtendahl's revision of Germar's tertiary fossils, Williston's notice of the Florissant *Syrphidae*, and mine of the Florissant arachnida, my comparison of the *Odonata* of Florissant and Green River, the detailed study of *Planocephalus* from Florissant, regarded by me as a new and practically headless type of thysanura, and, finally, the discussion of the structure of this strange type and of the supposed mite of the Rhenish brown coal, *Limnochares*, both of which Bertkau regards as *Galgulidae*. To this period also belongs my general survey of the paleontology of Florissant.

The additions to our knowledge of the amber insects of Prussia during the

past decade is surprisingly little. Besides the papers of Hagen and Kolbe on the *psocidae*, already alluded to, we have only a description of an *Embia* by Hagen, of three species of *Nothrus* by Karsch, of two *Bothrideres* by Stein, an account of *Elephantomyia* by Osten Sacken, and a generic list of hymenoptera by Brischke. Malfatti also describes two small insects from the Sicilian amber. A meagre showing indeed when the collections of unworked material are known to be so extensive. I have also noted but a single paper on the insects found in the recent gum copal, a description of two or three species by Quedenfeldt.

Here may fairly be mentioned a paper or two on recent insects which throw light on the structure of extinct types. One of these is the recent notice by de Selys Longchamps of the Japanese dragonfly, *Palaeophlebia*, which he makes the type of a new legion, to which he refers also *Heterophlebia* and other forms from the secondary rocks of England and Bavaria, and the tertiary deposits of the Rhine. In the other, on the post-embryonic development of *Julus*, Heathcote points out that the relations of the dorsal and ventral regions of the body of the young *Julus* correspond exactly with their permanent condition in *Euphoberia*, a carboniferous myriopod; and he further holds that the traces of the division of the dorsal plates found in the *archipolypoda* lend additional strength to the belief that they are composed in modern diplopods of two fused segments originally distinct; which the doubling of the internal organs and of the mesoblastic segmentation also indicates.

Among the new tertiary fields which have been opened, and which have given rise to some of these researches, and to others upon which I must not touch, are Felek in Hungary by Staub and others, Kutschlin, Bohemia, by Deichmüller, and various localities in upper Alsatia by Foerster, in the last of which about a hundred species have already been found, though none have yet been worked up. Peat beds have also begun to be sounded, and notes of their contents have been made by Früh, Geinitz, and Hollingworth, while similarly recent deposits have yielded a little to Brongniart, Kendall, and Sordelli. Wilkinson and Woodard have also shown us that insects may be expected from the tertiaries of Australia. To some places in our country I will refer later.

The more general diffusion of knowledge regarding fossil insects has been marked during the past decade. Important new discoveries have found their way into journals and into papers before scientific bodies, to such a degree that it is hard for the bibliographer to keep track of them. But besides these we have had very full analyses of the larger papers, among which those given by de Borre to the Belgian entomological society easily hold the first place. Bibliographies, like those of Malfatti and my own, annual reviews of the literature, like those given by Bertkau, Trouessart, Dalton, White, Marcou and others; general compilations of col-

lated material covering the whole field, like the excellent series published by Goss; others more or less partial or local, like the lists of Lacoe and Brongniart, or the dictionaries of Lesley and Miller, or some papers by Brodie and Goss; still others which pass the whole subject under one general review, like one of my own and those of Maurice and Vidal y Careta, — all these have served to advance in one way and another an interest in this department of science and to bring more or less order out of previous confusion or misunderstanding. The most pretentious of these undertakings is the general systematic survey entrusted to me by Zittel for his "handbook of paleontology," in which for the first time since Pictet and Giebel, or for more than thirty years, a systematic technical treatment of the entire series of fossil insects, myriopods, and arachnids was attempted, including tolerably full definitions throughout the paleozoic series and to some extent in the later, with a fullness and variety of illustration never before given. To gather together, as I believe is there done, even the smallest references and weld all into a connected whole would have been almost impossible, had I not begun at least twenty years ago a systematic card reference-catalogue in which every such allusion great or small is entered and which has been constantly perfecting and kept up to date. For English readers, the text of my contribution to Zittel's Handbuch was also published by our Geological survey, with a somewhat fuller treatment of the tertiary series, but without illustrations.

And now, in bringing this too long address to a close, you may perhaps ask what the outlook is for the future. I venture to predict that it will be quite as brilliant as the past. In the first place, publications bringing the whole known series of discoveries in systematic order up to date, like that just published, always have a tendency to bring out new facts and discoveries. Again, new localities are being found, and in fact, the public has as yet only tasted of the good things of Commentry and Florissant, the richest known fields in the world, respectively, for carboniferous and tertiary insects. When Brongniart tells us that he has six hundred cockroaches alone at Commentry, we may well hold our breath, and it is not to be believed that he will delay longer than he is compelled by the very richness of his field, the publication of the results of his study on the other insects whose classification has already been outlined by him. As to Florissant and our other tertiary fields, the work of illustrating the insects, for which thousands of drawings are already made, has, owing to unavoidable engagements, marched far ahead of text; but a volume, with descriptions of over five hundred insects, including mainly the lower orders, and with over eight hundred figures, is nearly ready for the printer. It will show that Florissant alone is as productive as all the tertiary fields of Europe taken together, if we exclude the insects found in amber. Yet during the

past summer, in explorations for the Geological survey, I found that the strata of a considerable tract of country, certainly many, probably hundreds of square miles in extent, lying in western Colorado and eastern Utah, were packed with fossil insects as closely as at Florissant, where they occupy a lake basin of relatively small proportions: whether these new localities will excel or even equal that place in the variety of their fossil treasures, is yet to be determined; but there can hardly be any doubt that we shall soon be able in our western territories to rehabilitate successive faunas as successfully as has been done with many of our vertebrate types, and as has not yet been done for insects in any country in the world. Nor are we confined to our later beds; insect deposits have now been found in a score of places in our extensive carboniferous series, and it is in no way improbable that we may find our own Commentry to double the value of the French discovery. What we really need is a score of trained workers to "go in and possess the land." No one would welcome them more heartily than one who is almost a solitary worker in the American field.

THE AMERICAN PLUM BORER 'EUZOPHERA SEMI-FUNERALIS' WALK.

BY STEPHEN ALFRED FORBES, CHAMPAIGN, ILL.

Although various boring insects have occasionally attacked the plum, these have been species whose principal injuries are done to other trees, and no distinctive plum borer has hitherto been known in this country. Among these incidentals enemies are the peach borer (*Sannina exitiosa*) the flat-headed apple-tree borer (*Chrysobothris femorata*) the so-called pear-blight beetle (*Xyleborus pyri*), and one of the twig borers (*Elaphidion villosum*). Somewhat recently a newly imported European bark beetle, *Scolytus rugulosus*. has attacked a variety of fruit trees, the plum among them, but by none of these insects has any constant and serious injury been done to the latter fruit, so far as I am now aware. In a species first described (in this country) in 1887, and whose immature stages have remained unknown until the present time, we have our first example of a borer devoted, so far as now known, to the plum alone.

This species was first reported to me as injurious 21 August 1887, in a letter from Farmingdale, Sangamon county, Illinois, accompanied by a few borers found in young Chinese plum trees (*Prunus simoni*), one of which was nearly killed by them.

The attack was described as most general near the forks of the trees, especially at the bases of the lower limbs, but the larvae were sometimes found an inch, or less, within the earth. The

smaller ones were near the surface of the bark, sometimes just under the thin outer film; but others were next the wood. As many as fifty were taken from a single tree, the bark here being killed in large irregular patches.[1]

Living borers received 3 November were about half an inch in length, of a greenish dusky color, with only a few scattered hairs springing from small dark specks. The head was reddish brown, with a darker triangular patch in the middle, and the top of the first segment behind the head, the cervical shield so called, varied from yellowish to pitchy, more or less shaded with brown, but with a median yellow patch. This borer has, of course, the three pairs of legs and the fleshy prolegs (ten in number) of the caterpillar. From the peach borer, whose structure is similar, it may be distinguished by its dusky color (the other being white), its smaller size when full grown, and, with a glass, by the hooks on the prolegs. In the peach borer the ends of the soft stump-like prolegs are provided with small brown hooks, arranged in two opposite curves discontinuous at their ends, each of a single row; while in the new plum borer the corresponding hooks form a complete ring, nearly covering the end of the leg.

Kept in a breeding cage and supplied with the chips and twigs of the plum trees, our larvae spun small webs in which they passed the winter. By 3 May a part of them had pupated, and 28 and 29 May two winged moths[2] emerged, all the others failing.

These moths were small grey insects, the extended wings measuring about eight-tenths of an inch. The fore wings were reddish behind (within); the hind wings were plain.

Other moths of this species were taken several times at the electric light in 1886, 1887, and 1888, the dates o their occurrence ranging from 5 May to 24 August. The greater part, however, were collected in May and June, and this is doubtless the period of the greatest prevalence of the winged form. The time and place of oviposition are unknown.

In brief, the species is apparently single-brooded; passes the winter as a larva in the tree; pupates in May; emerges in May and June, and may continue to lay eggs through July and August.

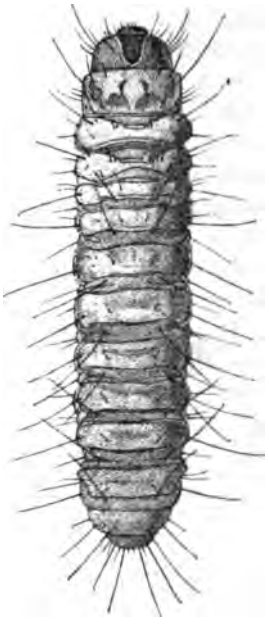
DESCRIPTION.

Larva.—The general appearance of this larva is that of a dusky somewhat hairy caterpillar, paler beneath, with reddish brown head, darker in the middle, and variegated cervical shield. Principal hairs conspicuously long and slender. The head is brown, with a lateral black blotch behind the eyes. smooth, much darker on the slightly depressed frontal area, this bordered by depressed black sutures, outside which, at a little distance, is a V-shaped fine

[1] I have found mention of the larval habits of only two other species of this genus (both exotic), one (*E. cinerosella*) living on wormwood (*Artemisia*), in Europe, and the other (*E. zellerella*) bred from dates.

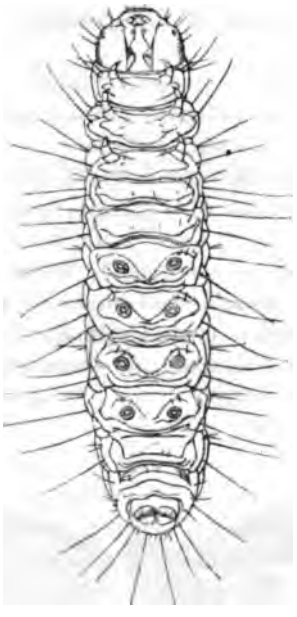
[2] Determined as above by Prof. C. H. Fernald.

white line. *Antennae* three-jointed; first joint very large, broadly conical; second thick, oval, with a very long stout hair at outer side of tip; the third minute. *Ocelli* five, black, placed behind the antennae in a curve opening downward.



Labrum broadly emarginate, with rounded lobes. *Maxillae* and *labium* pale beneath, with dark sutures strongly contrasting with adjacent parts of the head. *Mala* and *palpi* brown. *Labial palpi* minute. *Maxillary palpi* three-jointed, large; first joint nearly as thick as the *palpiger*, and about as broad as long; second joint cylindrical, width two thirds the length; third joint tapering, about two thirds as long as the second.

Body with six conspicuous rows of long pale hairs, longest on the posterior segments, one hair of each row to each segment, each borne on a minute black piliferous tubercle scarcely as large as the spiracle. One row above spiracles, another equally distant below, and two subdorsal rows. Other smaller hairs irregularly distributed.



Cervical shield yellow, smooth, with a few scattered hairs and two curved brown blotches, one on each side, separated by a yellow median spot. *Anal plate* coriaceous, brown, heart-shaped, with six long stout hairs at its posterior margin. Posterior segments without

spines or tubercles at hinder margin, differing here from the peach borer. Spiracles black, nearly circular, anterior pair but little larger than the remaining eight, last pair not exceeding the eighth in size.

Thoracic legs pale reddish brown externally, paler within, with dusky tips. Each proleg except the last pair with a complete close circlet of large hooks, and several smaller ones besides, and also a horny black central disk or tubercle within the ring. Last pair with a single half circlet of very strong close-set hooks.

Imago. — Expanse 20 to 25 mm. Head and thorax dusky gray with bright bronze reflection. Abdomen similar, and also brightly bronzed, but with edges of segments pale. Fore wings light gray, with brownish red and black markings. Posterior two thirds of basal field brownish red, with scattered reddish scales along the costa also, the reddish tint deepest along the middle of the wing. Basal line near

the middle of the wing white, sometimes obsolete posteriorly, making, when complete, two external and three internal angles. Middle field black mixed with gray except at posterior margin, where it is largely suffused with reddish brown. White scales usually forming distinct discal spots, in one case broadly ringed with black. Outer line variable; when distinct, with two internal and one external angles. Commonly distinctly bordered with black within, and followed without by a reddish shade (except near costa, where this merges in black, which is broadly bordered by light gray). A marginal black line, commonly broken by veins. Fringe dusky, with white line at base. Hind wings smoky, with black marginal line and dusky veins, and fringe with white basal line followed by a dusky band, beyond which it is paler. Surface of hind wings considerably bronzed, the fore wings less so. Beneath, wings fuscous bronzed. Outer field of fore wings somewhat paler, hind wings gradually darkening outward.

Antennae dark; proboscis gray; palpi dusky bronzed.

Described from twelve Illinois specimens.

Distribution; Colombia, S. A. (Zeller), Florida, Texas, Colorado, Utah, Washington. Pretty general throughout the eastern United States and Canada.— Hulst.

LITERATURE.

The species was first described in 1863 as *Nephopteryx semi-funeralis* by Walker in the British Museum catalogue, part 27, p. 58; and again in 1882, according to a note kindly sent me by Mr. Hulst, as *Euzophera impletella*,

Zeller,[1] this description being based on specimens from Colombia, S. A. In this country it was described by Hulst in 1887 in Entomologica Americana (v. 3 p. 137) as *Stenoptycha pallulella*.

The original description of the genus was given by Heinemann under the name *Stenoptycha*, in 1865, in his work on the lepidoptera of Germany and Switzerland,[2] but as this generic name was preoccupied by Zeller,[1] the genus was rechristened *Melia* by Heineman, on a later page of the same work.[2] *Melia* proved, however, also to be preoccupied[3] as noted by Zeller in 1867, and the current *Euzophera* was then finally proposed.

1 Hor. Soc. ent. ross., 1882, v. 16, p. 224.

2 Die schmetterlinge Deutschlands und der Schweiz, 1865, p. 190.

1 Entom. zeitung Stettin, 1863, p. 154. Zeller's use, of this name for a genus of *pterophoridae* is also illegitimate, as it has already been applied by Agassiz to a Medusa (Contr. nat. hist. United States, 1862, v. 2, p. 149)

2 *l. c.*, p. 209.

3 Used previously in *muscidae*, *pyralidae*, crustacea, mollusca and botany.

4 Entom. zeitung Stettin, 1867. p. 377.

DESCRIPTIONS OF SOME NEW NORTH AMERICAN MOTHS.

BY WILLIAM BEUTENMÜLLER, NEW YORK.

DATANA MODESTA, n. sp.

Head and thoracic patch yellowish ochreous, remaining parts of thorax rusty brown. Primaries rusty brown with a small, elongated, discal spot on the middle of the wing and another smaller spot before the middle. About the apical fourth of the wing is an ill-defined, transverse, curved band a little darker than the ground color. Beyond this band the wing assumes a purplish brownish color. Secondaries much paler than the primaries. Body above yellowish ochreous, beneath pale ochreous. Secondaries beneath pale ochreous, primaries somewhat darker. Expanse 48 mm. 1 ♂. Hab. Kissimmee, Florida, May, Type Collection, Chas. Palm.

Allied to *D. floridana*, but differing from it by having the thoracic patch yellowish ochreous, and by the absence of the two additional transverse bands.

DATANA PALMII, n. sp.

Head and thoracic patch deep velvety brown, remaining parts of thorax cinnamon brown, mixed with whitish scales. Primaries cinnamon brown (in one specimen nearly as deep in color as *D. angusii*) and thickly covered with whitish scales so as to nearly obscure the ground color. Across the wing are four narrow, transverse bands same as the ground color. The first on the basal fourth, oblique; the second a little before the middle slightly curved; the third a little beyond the middle and

the fourth on the apical fourth, both these bands are curved outwardly. Secondaries pale cinnamon brown. Primaries beneath same color as the secondaries above. Secondaries beneath ochreous. Expanse 48 mm. 4 ♂♂. Hab. Delaware Water Gap. Penn. June. Collected by Chas. Palm to whom I gratefully dedicate this odd species.

Allied to *D. integerrima*, from which it can be distinguished by the absence of the two discal spots, different position of the bands and also by the different color.

Both the foregoing species were compared with the types of allied species.

ORGYIA INORNATA, n. sp.

♂ Body above and below fuscous, pectinations of antennae blackish, stalk grayish. Primaries uniformly fuscous with a curved, transverse band beyond the middle, bending inwardly as it reaches the inner margin. Secondaries fuscous. Wings beneath somewhat paler than above. Expanse 15 mm.

♀. Wholly dirty whitish above and below. Length 16 mm. Width 7 mm.

1 ♂. 2 ♀♀. Collection W. Beutenmüller. Hab. Enterprise, Fla. May.

Differ from all its congeners by the absence of the ante-apical white spot near the inner angle, and by its plain coloration.

LARVA.—Head and cervical shield bright coral red. Body above mouse color with three rows orange tubercles along each side. Each tubercle provided with a bunch of long, silvery gray hairs. Along the subdorsal region of the second, third, ninth, tenth, eleventh and twelfth segments is also a row of orange tubercles with silvery gray hair while on the dorsum of the fourth, fifth, sixth and seventh segment is a thick bunch of white hairs and from the eighth segment to the end of the body there is a broad, black stripe, with three small orange spots on each segment. On each side of the anterior parts of the first segment is a long, black pencil and one on the eleventh segment which is brown at the base. A few brown hairs are also scattered here and there over the body. Underside yellowish green. Length about 30 mm.

FOOD-PLANTS. Live oak (*Quercus virens*), and cypress (*Cupressus*).

COCOON.—Similar to that of *O. leucostigma* light brown, oval, composed of fine silk, interwoven with the hair of the larva. Length 25 mm. Width 12 mm.

ENTOMOLOGICAL SOCIETY OF LONDON.—At the meeting of the Entomological society of London held 7 August 1889. Dr. C. V. Riley was elected an honorary fellow in place of the late Dr. V. Signoret. The number of honorary fellows is limited to ten, and less than forty of the most celebrated entomologists in the world have been thus honored. Dr. H. A. Hagen was elected in 1863. Dr. J. L. Leconte in the same year and Dr. A. S. Packard in 1884.

Classified according to the land of their birth there are but two Americans, Drs. Leconte and Packard.

Prof. C. H. Fernald was elected a fellow at the meeting held 4 September 1889.

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CONTENTS:

ADVERTISEMENTS 302
SYNOPSIS OF THE ODONATA OF NORTH AMERICA, No. 2. THE GENUS ANAX.—*Hermann August Hagen* 303–308
THE ARGYNNIDES OF NORTH AMERICA.—*Henry John Elwes* 308–317
INSECTS OF BERMUDA 317–318
DESCRIPTION OF THE LARVA OF MEGALODACNE FASCIATA, FABR.—*William Beutenmüller* 317
OBSERVATIONS ON SATURNIA IO.—*Holmes Hinkley* 318

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PSYCHE.

SYNOPSIS OF THE ODONATA OF NORTH AMERICA, NO. 2. THE GENUS ANAX.

BY HERMANN AUGUST HAGEN, CAMBRIDGE, MASS.

1. ANAX LONGIPES.

Anax longipes, female, Hagen Synop. Neur. N. A., 1861, 118, 2; Stett. ent. zeitung, 1863, v. 24, 373, 52; Verhandl. Wien zool.-bot. ges., 1867, v. 17, 35; Proc. Bost. soc. nat. hist., 1874, v. 16, 350, 2; Synop. Odon. N. A., 1875, 32, 2.—Brauer Reise österr. freg. Novara, 1866, bd. 2, 60, 3.—Male, M'Lachlan Ent. mo. mag., 1874, v. 10, 227; 1883, v. 20, 129, 171.—Hagen, *op. cit.*, 1883, v. 20, 169.

Male (living), eyes dark reddish brown; head, thorax, base of abdomen green; abdomen beautiful brick red; front green; without any spot above; vertex, antennae, occiput black; eyes behind with a very large elongated green spot; thorax beautiful green; legs black, femora yellow, the articulation with the tibiae and the inside of the anterior femora black; posterior tibia 12 mm.; posterior femur 16 mm.; hind legs reaching beyond the fourth segment; abdomen with the two basal segments inflated, green; first segment with two brown spots on the basal thoracical impression; second segment with a transversal dark median stripe, a darker anteapical spot and two round apical reddish green spots; the transversal median stripe is interrupted in the middle by a granulose somewhat triangular plate; the following segments of a beautiful brick-red, segments 3 to 5 with a brown triangular apical spot, less marked in 6, and a triangular basal brown spot on 4 and 5; all of these spots disappear in the dead insect, and the color of the abdomen becomes an indifferent reddish brown; last segment above with a narrow impressed rim at the middle of the base; appendages brick-red; the superiors as long as the two last segments, straight, narrow, cylindrical at base; along the external margin with an elevated keel ending in a short spine on the apex; a large basal excision internally; the inner margin of the following part is also slightly excised; inferior appendage very short, narrowed to tip, with two apical black tubercules above; on each side of the second segment below there is a small pointed spine on the basal plate near the margin of the genitals.

Wings hyaline, venation black, costa yellow, pterostigma narrow, yellow;

membranula black, white at base; antecubitals 17—19, postcubitals 8—10.

A male from Haulover, Fla., 3 March, though of a slightly smaller size, is not different. One from Haiti also of a similar size differs by the unfinished color of the occiput (it is somewhat livid) and by the presence of a yellowish tinge in the middle of the hind wings. Three males from Mexico are a very little smaller, but do not differ except that the femora are very dark brownish red, the pterostigma a little darker and there is a yellow tinge in the middle of the hind wings.

Female (living), head, thorax, legs and the two basal segments of the abdomen as in the male; eyes blue, the hind margin of the occiput on each side yellow; second segment with a transversal brownish median stripe on each side; a darker anteapical spot, and two apical blue ones; abdomen from the third segment brown, segments 3—9 with two apical blue spots, segments 3—7 with two basal blue spots, and segments 4—6 with two intermediate blue spots; appendages light brown, as long as the two last segments, lanceolate with an elevated keel to the tip, which is not sharply pointed; wings as in the male; 19 antecubitals, 9 postcubitals.

Two females from Florida are a little smaller, the color and pattern are similar, the last segment is light brown.

Race CONCOLOR.

Anax concolor Brauer Reise österr. freg. Novara, 1866, bd. 2, 66, pl. 1, f. 15, app. ♂.—Hagen Synop. Odon. N. A., 1875, 38, 2.

Male, though a little smaller it is entirely similar to *A. longipes*, except the color of the abdomen, which for segments 3-10 is not red but dark brownish-black with the pattern of large spots just as in the female; color of these spots yellowish; the two basal segments in color and sculpture as in *A. longipes;* appendages red, occiput more livid; wings as in *A. longipes;* antecubitals 15-19; postcubitals 8-9; the abdomen also is similar to that of the described living female; the blue spots are retained perfectly in the dead specimen.

	Longipes ♂			Concolor ♂
	Mass.	Fla.	Haiti. Mexico.	Brazil.
Length.	85	79	74 72	70-74
Abdomen.	58	55	53 50	50-53
Appendages.	6	6	6 6	6
Exp. wings.	110	102	102 100	92-95
Hind wing.	53	51	51 48	44-48
Pterostigma.	6	6	5 5	5

	Longipes ♀		Concolor ♀
	Mass.	Fla.	Brazil.
Length.	86	76-73	76
Abdomen.	60	56-52	54
Appendages.	6	6-5	5
Exp. wings.	114	103-99	100
Hind wing.	56	51-49	48
Pterostigma.	6	6-5	5-4½

HAB. Georgia, Abbot, a male in the Museum of science and art, Dublin; a female (my type) in the collection of Escher Zollikofer, now in the University museum in Zurich, Switzerland; two males and one female collected by myself, 25 August, 1875, at Woods Holl, Mass.; a female (not seen by me) collected by Mr. P. R. Uhler, in 1875 near Baltimore, Md.; a female collected by Mr. R. Thaxter in 1875 in Florida, and

a pair collected by Mr. H. G. Hubbard 3 March, at Haulover, Florida; two males Jalapa, Mexico and one male Amula, Guerrero, Mexico, 6000 ft. August, Mr. H. H. Smith; one male collected by Mr. W. Cabot, 14 February, 1884 in Haiti; var. *concolor* three males, one female collected by Mr. H. H. Smith at Matto Grosso, Brazil; one male, type of Brauer (not seen by me), near Rio Negro, Brazil. I am glad to record 19 specimens of this species, which has been considered very rare. When I described *A. longipes* only the female was known, and when Mr. Brauer described *A. concolor* but one male was in his hands. The number of males now before me makes it certain that *A. concolor* is only a southern race of *A. longipes*, having the pattern of the abdominal spots of the female also preserved in the male. I confess that a similar race of an *Anax* or of an *Aeschna* is unknown to me, but the exact identity of all other characters agrees well with my opinion. The splendid brick-red color of the living male may perhaps be variable, as I have seen but two males alive. It is remarkable that both the male caught by myself and the female caught by Mr. Thaxter had captured a *Papilio asterias*, had cut off the head of the same and were ready to devour their prey when caught themselves.

Mr. W. Cabot also brought from Haiti some nympha skins which probably belong to *A. longipes*. They are of the size of *A. junius* but are red. I am not able to make out any specific difference.

Mr. L. Cabot, Mem. mus. comp. zool. v. 8, p. 17, has described the supposed nympha of *A. amazili*, from Jamaica; he now believes this to be identical with the nympha from Haiti, supposed to belong to *A. longipes*.

2. ANAX JUNIUS.

Libellula junia Drury Ill., 1770, v. 1, 112 pl. 47, f. 5.

Aeschna junia Burm. Handb., 1839, v. 2, 841, 18.—Say Journ. Acad. nat. sci. Phil., 1839, v. 8, 10, 2.—Ramb. Nevr., 1842, 196, 6.

Anax junius Selys Rev. Odon., 1850, 328.—Sagra Ins. Cuba, 1856, 458.—Hagen Synop. Neur. N. A., 1861, 118, 1; Stett. ent. zeitung, 1856, v. 17, 369; 1860, v. 21, 213; 1863, v. 24, 373, 51; Verhandl. Wien zool.-bot. ges., 1867, v. 17, 33; Proc. Bost. soc. nat. hist., 1868, v. 11, 291; 1873, v. 15, 271, 28; 1874, v. 16, 350, 1; Synop. Odon. N. A., 1875, 32, 1.—Brauer Reise österr. freg. Novara, 1866, bd. 2, 61, 10.—Walsh Proc. acad. nat. sci. Phil., 1862, 397.—Cabot Mem. mus. comp. zool., 1881, v. 8, 15, 4, pl. 1, f. 2.

Anax spiniferus Ramb. Nevr., 1842, 186, 4, pl. 1, f. 14.

Head and thorax grass green, abdomen ultramarine blue (male), obscure pale purple or lilac (in the living female)[1]; front above with a round black spot with a circular dark blue band around; feet black, femora rufous; first segment and the base of the second

[1] These colors of the living insect were given to me by the late Benj. D. Walsh.

green, with the transverse elevated rim not interrupted, but united with the opposite one at a right angle; a dorsal fuscous fascia, interrupted and partly angulose on the abdomen after the basal segments; male appendages dark fuscous, straight, enlarged towards the apex, with an internal excision on the tip and a sharp external apical spine; inferior very short, quadrangular, transverse; those of the female lanceolate; wings hyaline, flavescent or not in the middle; costa yellow, also the narrow pterostigma; membranula black, white at base; antecubitals 16 — 19, postcubitals 7—9.

Length,	68-78
Exp. wings,	104-116
Pterostigma.	7

HAB. St. John, New Brunswick, August; Canada, St. Hyacinth, Quebec, Provancher; Hamilton, Ontario, end of August, Moffat. United States: Mass., Magnolia, Milton, Brookline. — N. Y., N. J., Pa., Philadelphia.—Md., Kent., S. C., Geo., Fla., Mo., La., Tex., Ill., Mich., Minn., Dak., Nev., Cal., Or. The Dalles, June.—N. Mex., Ariz., Alaska, Sitka.

Mexico: Matamoras, Jalapa, Amula 6000 ft.—Costa Rica.

Antilles: Cuba, Poly; Martinique.

China: Petcheli Bay, April. Osten Sacken; Kamtschatka.

Sandwich Islands: Oahu, Honolulu, Taiti (Selys).

I have described as *A. strenuus* a female, now in the Copenhagen museum, from Oahu, collected during the circumnavigation of the GALATHEA. The only difference from *A. junius* consists in the shape of the occiput (the lateral lobes being longer, more elevated and quadrangular) and in the gigantic size. Length, 94 mm., exp. of wings, 136 mm. The specimens of *A. junius* from Oahu are all very large, but the size of this giant is entirely unusual. I have before me a number from Oahu but none of them similar in size.

3. ANAX WALSINGHAMI.

Anax walsinghami M'Lachlan Ent. mo. mag., 1883, v. 20, 127, 171.

Anax validus Hagen Synop. Odon. N. A., 1873, 32 (no description); Cabot Mem. mus. comp. zool., 1881, v.8, 15.

Head yellow, front with a round black spot in a blue ring, anteriorly bordered with a fine black line; vesicle black, transversely yellowish above: antennae black, seta brownish; occiput yellow, emarginate; head behind yellow, with a superior narrow blackish margin; thorax green; feet black, femora reddish brown, the anterior yellow beneath; length of the posterior femora about 14 mm; abdomen very long (male), especially segments 5—6, shorter in the female; blue at base, suture of second segment interrupted at the middle, a dorsal blackish band, beginning on the fifth segment and finishing on the ninth with an apical elongate blue spot on each side, and a basal whitish one on segments 8 and 9; the last segment as broad as long (male) blue, margin black and irregularly black on the dorsal line; superior appendages of the male, short, broad, brown, flattened and foliaceous, upturned on the

apex; in front of the appendages a deep excision forms a strong, long tooth; inferior appendage one half shorter, slightly longer than broad, shallowly excised on the tip. Appendages of female short, oval. Wings large, hyaline, neuration black, costa yellow, pterostigma short, brown; membranula black, white at base; antecubitals 19—16; postcubitals 10—8.

	Male.	Female.
Length,	105	95
Abdomen,	85	77
Exp. hind wing.	125	120

HAB. California, San Diego.

This species was discovered by the late G. R. Crotch in 1872. He gave two splendid couples to the Museum of comp. zool. Later several specimens were collected in northern California by Lord Walsingham; the collection of the Museum has two males from Tucson, Arizona. An incomplete male (not seen by me) from Guatemala is in M'Lachlan's collection. Mr. L. Cabot in "The immature state of the odonata. Part 2. subfamily *Aeschnini*" 1881, p. 15, mentions some nymphae from San Diego, California, more bulky than *A. junius* and with two black teeth in the middle of the comb of the front border of the mask and another large nympha from New Mexico. It was believed rather doubtful that nymphae so similar to those of *A. junius* should belong to the gigantic and very different *A. validus* (=*walsinghami*). After a new and detailed study of this subject I think these nymphae may belong to *A. walsinghami*.

4. ANAX AMAZILI.

Aeschna amazili Burm. Handb., 1839, v. 2, 841, 19.

Anax maculatus Rambr. Nevr., 1842, 188, 7.

Anax amazili Hagen Synop. Neur. N. A., 1861, 119, 3; Verhandl. Wien zool.-bot. ges., 1867, v. 17, 38; Synop. Odon. N. A., 1875, 32, 4; 38., 1.—Brauer Reise österr. freg. Novara, 1866, bd. 2, 61, 9.

The color of this species is black and and green but the green is not so beautiful as in *Lepthemis vesiculosa* Fabr. This note is by Mr. Veilenmann and made from specimens collected by him in Pernambuco, Brazil. My description in the Synopsis is made from Professor Burmeister's types.

HAB. Guatemala; Cuba; Barbados; Porto Cabello, Venezuela; Amazon, Para, Pernambuco, Rio, Brazil.

There are on the whole continent of America only four species of *Anax* known. The gigantic size and brilliancy of their colors makes it rather improbable that any new species will be found, but of course it is not impossible. Of the four species *A. junius* is strictly North American, passing down a short distance to the Isthmus and the Antilles. This species is apparently introduced into the Sandwich Islands, where its size is larger, and in the north in China and Kamtschatka.

A. longipes is a South American species, passing along through the Antilles and Florida and, favored by the Gulf stream, to southern Massachusetts.

A. walsinghami is a North American

species, found west of the Rocky Mountains, extending south to Guatemala.

A. amazili is strictly a South American species extending to the north to the Antilles and Central America.

There are two species in Australia, three in Europe, four in Africa and perhaps ten in Asia.

THE ARGYNNIDES OF NORTH AMERICA.

BY HENRY JOHN ELWES, CIRENCESTER, ENGLAND.

[Reprint, p. 563-575, from "A revision of the genus Argynnis," (Trans. ent. soc. London for the year 1889, p. 535-575.)]

The Argynnides of North America are, without exception, the most difficult butterflies to classify that I have ever studied. I have a collection which includes authentically named specimens of almost all the species and varieties, many of them direct from such well-known collectors as Messrs. H. Edwards and Morrison; many from Messrs. Strecker and Geddes. I have also seen some of the best collections in the United States, and studied all, or almost all, the large mass of scattered literature and notes on the genus by Messrs. W. H. and H. Edwards, Mead, Geddes, Scudder, and Strecker. I have repeatedly tried to construct a key by which the supposed species could be identified, and can only say that I have completely failed. I am certain that no entomologist, who received to-day the most perfect collection which could be got together from all parts of North America, and had to classify and describe them without regard to the works of others, would make anything like as many species as have been recognized. It seems presumptive for a man to set aside much of what has been written by those who have seen, both living and dead, so many more specimens than I have seen, and yet I cannot, in dealing with the American forms, adopt as specific, characters so slight and variable that they would not be recognized as such in the much better known European species. And to show that it is not my ignorance alone which makes the difficulty, I may say that it is just those species which I have personally observed in life, and which I have most carefully examined, such as *A. eurynome*, *A. liliana*, *A. monticola*, and *A. meadii*, in which I have found my uncertainty the greatest. Mr. Strecker's remarks, on p. 118 of his Catalogue, are so much to the point that I will quote them here, and can only say if our American colleagues do not agree with them, let them rather point out how others may under-

stand their conclusions, than blame me for not adopting what I cannot see:— "The Argynnides of the western slope, or Pacific side of the Rocky Mountains, are without doubt, if we except, perhaps, the Coliades, the most difficult of all the North American Diurnae to deal with, as they not only run into certain variations, but again into subvariations, or even further. The two species *monticola* and *zerene*, first considered identical by Dr. Boisduval, are perhaps the most perplexing; each of these bears the same relation to some of their varieties as does *niobe* to its var. *eris* and *adippe* to *cleodoxa*, but presenting by no means the stability of forms of these European variations, but branching out into endless and endless varieties until the student is completely at a loss to know where or to what they may belong."

Scudder, in the 'Butterflies of New England,' has figured the abdominal organs of several species of *Argynnis* on plate 33 which gives an opportunity of comparing some nearly allied species. Those of *A. cybele*, fig. 44, *A. aphrodite*, fig. 40, are very similar indeed, but as they do not appear to agree exactly with the descriptions, and the figure of that of *aphrodite* is not alluded to in the description on p. 565, I do not know whether the description was made from the same specimens figured, and whether we are to attribute the difference to variation, or to incorrect drawing. The clasper of *atlantis* fig. 36, also much resembles those of *cybele* and *aphrodite*, but has the hook longer and nearer the clasp. The figure of the androconia of these three species, plate 46, figs. 12, 13, 14, are also very similar, and, taken in connection with the claspers, do not lead one to suppose that very much help will be given in deciding the relationship of nearly allied species in this genus by a microscopic examination. The claspers of *A. myrina*, *bellona*, and *montinus*, plate 33, figs. 35, 38, 42, all included by Scudder in the genus *Brenthis*, show a general similarity of form *inter se*, with the same minor differences as those of *cybele*, *aphrodite* and *atlantis*. I at first supposed that some difference might be found in the scales clothing the median veins in the males, but on examination with a powerful lens *idalia* is the only North American species in which the raising is conspicuous, though in some specimens of *atlantis* and *aphrodite*, and others, it is clearly perceptible. The tuft of silky hairs on the subcostal nerve is present in the males of all the larger species that I have examined, and is very conspicuous in *idalia*, but I have not found it in the smaller species which have been separated under the genus *Brenthis*.

A. idalia and *A. diana* are two of the most beautiful species in the whole genus, and may be said to form the best links between those species of Eastern Asia, which end the Palaearctic series, and the American species, which are isolated from them. *A. diana* has the sexes more different than any except *sagana*, and if the genus was divided into groups would be another instance of an American species having its

nearest affinities in Northeastern Asia and Japan, of which we have several among the plants of the Alleghany Mountains.

A. aphrodite, *A. cybele*, *A. alcestis*, *A. cypris*, *A. halcyone*.— This is a group of species or forms which are extremely hard to define, and though Edwards and Scudder, and most other North American entomologists, agree in keeping them separate, I think it is very difficult, if not impossible, to identify them unless you know their habitat. I have a pretty good series of all except *cypris*, which must be very close to, if not identical with, *alcestis*, and judging by the character of the median veins in the fore wing of the male, by the color and pattern of the under side, which are the best characters I know by which to define the species, I am certainly inclined to follow Strecker rather than Edwards. There have been so many mistakes made in identifying these species by collectors that their geographical distribution is not very easy to follow out; though Mr. Scudder's maps are useful, they are by no means infallible, and the northern and western range of *aphrodite* and *cybele* is certainly not defined at present. I received from Morrison a pair of *cybele* from Montana, which agree with those taken by Geddes in the Northwest Territory of Canada, near Edmonton, being smaller than those from the eastern states. According to Scudder and Edwards, however, *cybele* does not occur in Montana, and the Edmonton habitat is quite isolated; whilst *aphrodite*, which is unmentioned by Geddes in his lists of north-western butterflies in *Canadian entomologist:* vols. 15, p. 221, 16, p. 56 and 224, is stated by Scudder and Edwards to occur at Edmonton. Either such experienced collectors as Morrison and Geddes did nor know *aphrodite* when they saw it out of its usual range, or Scudder and Edwards are mistaken. Though it seems undoubted that typical eastern specimens of these species can be distinguished (for the points of difference see Scudder, p. 566), yet the differences are so slight that it may not be possible to identify western specimens with one or the other, and this difficulty seems to have been got over in Edwards' case by creating other species, such as *alcestis*, *cypris*, and *halcyone*, which cannot be identified with any certainty from his figures or descriptions; and which, notwithstanding all that has been written upon them, must remain, as far as I can see, "species dubiae" to those who have not specimens identified by their author at hand for reference.

A. leto is a species which, though undoubtedly nearly allied to *cybele*, is fully as distinct from it as *nokomis*, and may be regarded as its Pacific coast form, in the same way as *nokomis* is the form of the dry central plateau of the continent. Though the male is not very different from the male of *cybele* yet the female, which on the upper side is hardly distinguishable from the females of *nokomis* and *notocris*, is marked by the strong contrast between

the deep chocolate, almost black, of the base and inner area of the wings and the pale yellowish color of the area. Its range extends along the Pacific coast from Central California to Washington Territory, and it is recorded also by Geddes from Fort Macleod, in the Northwestern Territory of Canada, on the eastern side of the mountains. Those I have from Washington Territory are considerably darker at the base of the hind wings than others from Plumas county, California; and I should not be at all surprised if a large series from different localities were to show forms intermediate both with *cybele* and *nokomis*.

A. carpenteri is unknown to me, except from the description, which seems to point to a form of *cybele*. It was described from two males and one female taken by Dr. Carpenter in New Mexico at a high elevation above the timber line, and is said by Mr. Edwards to be of the size of *atlantis* and near *cybele*.

A. nokomis and *nitocris* are regarded by Mr. Edwards, in his last catalogue, as distinct; he cites, however, Strecker's figure of *nokomis* female, in Ruffner's report, as an aberration of *nitocris*. This is just one of those cases which prove how difficult it is to follow Edwards's authority in such matters. It so happens that I have two excellent pairs of *nokomis* from Arizona, sent by Mr. H. Edwards, which exactly agree with Mead's figure cited by Edwards. I have also a pair of *nitocris*, the male from Utah, sent by Mr. Strecker, the female from Arizona, agreeing with it, so marked by Mr. H. Edwards. "I think this species passes as *A. nitocris*, female." It differs from *nokomis* in having the under side of hind wing to the second row of spots cinnamon-color, as in *cybele*, and is exactly intermediate between *nokomis* and *leto*. The specimen figured by Strecker in Ruffner's report, and cited by Edwards as an aberration of *nokomis*, is, to my eye, much more like *leto* than it is to *nitocris* or *nokomis*; and Mr. Strecker's remarks are as follows:—"The present two examples from Colorado differ notably from all those from Arizona in the following particulars: On under surface the red color of primaries is darker, and covers evenly the whole wing except toward and at the apex; on the secondaries the whole space interior to the second of the two outer rows of silver spots, which in the Arizona examples is powdered greyish green, is deep reddish brown, nearly of the same color as in the female *aphrodite*, or the male of *leto*; they are larger than most of those I have seen from Arizona. On the upper side it presents no differences. I have always contended that *nokomis* was a pale abnormal form of *cybele*, of which we have so many other instances in the species from the dry salt regions of Utah and Arizona, and these intermediate examples from Colorado, with their dark reddish under sides, seem to strengthen my opinion. I can but regret that no males were captured (unless the following be really its male)*, as I consider this is

*This is put down as *cybele* by Mr. Strecker, who is astonished at receiving it from Colorado, and is strongly

by far the most interesting insect in the whole collection."

A. aphrodite is a very wide-ranging species, which varies enough in the Western States to have received at least three names, for I cannot see how to distinguish *alcestis* or *halcyone* in the perfect state, though Edwards says the larva of *alcestis* is different, and places *halycone* in a different subgroup with *coronis*, *calippe*, and *edwardsi*, on account of the larger and more egg-shaped form of the silver spots on the under side. When, however, a good series is compared together (I have sixteen males and twelve females of this group from various States), I cannot see that his supposd distinctions are constant, and though *nausicaa*, of which I have four males and five females, taken by Messrs. Hulst and Morrison, is distinctly of a deeper red on the upper surface than any of the rest, yet its under side, like that of *halcyone*, has nothing sufficiently marked to distinguish it. Mr. Edwards perhaps would say that my *halcyone*, which were sent by Mr. Strecker, and taken near Denver, are not true to name; but what else can they be from that locality? It only shows that if a describer of insects does not make his descriptions sufficiently comparative and clear to be followed by others, he must not be surprised if others refuse to accept them. Larval characters alone, which are liable to vary like those of the perfect insect, and which cannot be easily compared by others, are not in my opinion sufficient.

With regard to *A. nausicaa*, however, I see a point not alluded to by Mr. Edwards, which may be sufficient to separate it, namely, the much less abundant and shorter tuft of hairs on the subcostal vein of the hind wing in the males. This tuft is prominent in all males of *aphrodite*, *alcestis* and *halcyone* which I have examined; in *nausicaa* it is much less conspicuous, and, taken in conjunction with the isolated habitat and deeper color, is probably enough to distinguish it.

A. atlantis is another species which I find it uncommonly difficult to decide about, not so much when the eastern form alone is before me, but when the numerous western species or forms have to be considered. Mr. Edwards has got over the difficulty by naming them all separately, and Mr. Scudder, though he was not perhaps obliged to mention them in the 'Butterflies of New England,' says nothing as to their very near relationship. He remarks as follows:—"There is no need of confounding this species with either of the preceding [*aphrodite* and *cybele*]: it is smaller than they, duller in tint above, has a blackish border to all the wings in both sexes, and more continuous mesial band on the upper surface of the hind wings; the darker colors of the under surface of hind wings are deeper in hue than in either of them, while the buff belt is wider than that of *aphrodite* and narrower than that of *cybele;* the buff scales on the basal half of the wing also assume more im-

inclined to the belief that it is the male of the above described form of *nokomis*.

portance than in the other species; finally the costal border of the fore wings does not appear to be quite so much arched. It is possible, perhaps even probable, that this species is the true *Papilio aphrodite* of Fabricius, but as it is quite impossible to be certain of it, the names ought to stand as given by Mr. W. H. Edwards, who first clearly distinguished the species in this difficult group. The species were still confounded in the British Museum, after the publication of Butler's Fabrician butterflies, as I myself saw, and notwithstanding Butler's remarks on p. 108 of that work." Its distribution, according to Mr. Scudder, is much the same as that of *cybele* and *aphrodite*, but extends to Newfoundland, Labrador, and the Hudson Bay Territory; on Mead's authority he also gives Colorado, but Edwards calls the form found here *electa*, which also ranges into New Mexico and Montana. Whether this is the same or not I cannot be certain, as the description of *electa* in 'Field and Forest' is inaccessible; but I have a pair from Colorado, given me by Mr. Holland (which are named *electa*, I believe, by Mr. Edwards), and a female from S. W. Colorado, taken by Morrison, which I cannot separate from *atlantis*. Mead also gives a clue to the correctness of this identification with *atlantis* by mentioning the strong musky odor of the Colorado species, a peculiarity of *atlantis* to which Scudder calls attention. Geddes says that *atlantis* occurs in all parts of the Rocky Mountains north of the American boundary which he visited, and if this is correct, it can hardly be absent from Montana and Colorado. But at the same time I must say that the male of so-called *electa* does not differ from the female as does another male from Colorado (sent by Mr. H. Edwards as *hesperis*) in having the silver spots of the under side partially obsolete. If, therefore, *hesperis* and *atlantis*, which are placed next to each other by Mead, and stated to occur at the same elevation in Colorado, run into each other, as they seem to do, we are led into the belief that *atlantis* is liable, in the west, to the disappearance of the silver spots, which takes place in other American and European species; and then there is no reason why some of the forms which occur on the Pacific States, such as *columbia* should not also belong to *atlantis*. I do not say that they are so because it would be unwise to do so without knowing them in nature better than I or any living American naturalist does; but on the other hand I can see nothing in the writings and figures of Mr. Edwards to prove the contrary, or to enable others to distinguish them. *A. columbia* H. Edw., was by him considered as so near to *atlantis* that it might be only a variety of it. It was described from four males taken at Lahache, near the Alaskan border of British Columbia, and there is nothing in the description worthy of note; but, when going through Mr. Edwards's collection, I noted it as similar to *hesperis*.

A. lais, of which I have seven of the specimens from Red-deer River, from which the species was described, seems to me very near *atlantis*, but separable by the smaller size, paler color, and apparently by the less raised scales of the submedian veins in the male. Edwards, however, says it is of the size of *atlantis*, and stands between that and *aphrodite*. Geddes does not tell us how to distinguish them, but says that it was found on the prairies about Fort Edmonton, while *atlantis* occurred in the mountains.

A. coronis is a species which seems to have a very wide range west of the Rocky Mountains, and varies a good deal, but may be recognized in most of its forms by the large ovoid silver spots of the under side of the hind wing. It is apparently most nearly allied to *edwardsi*, with its forms *nevadensis* and *meadii*, but these differ in the longer, narrower shape of the fore wing, and do not seem to be found on the Pacific coast. There occur, however, in Nevada forms which are described as *laura* and *macaria*, of which I have authentic specimens from Mr. H. Edwards, and which, by their under sides, seem to be *coronis;* whilst *chitone*, also sent by Mr. H. Edwards from Nevada, does not agree with W. H. Edwards's description on the under side, and is nearer to *nevadensis*.

None of these names can, in my opinion, be retained except as synonyms, though they are all three kept up in Mr. W. H. Edwards's 1889 Catalogue as distinct species.

Whether *edwardsi*, *nevadensis*, and *meadii* are distinct is a more doubtful question. Certainly *meadii*, which I have taken in the Yellowstone Park, looks very different from the large *edwardsi* of Colorado, but I have some from Montana, taken by Morrison, and from the N. W. Territory of Canada by Geddes, named *nevadensis*, which are perfectly intermediate in size and color; whilst others, sent by Strecker as *nevadensis* from Colorado, resemble *aphrodite* in the color of their hind wings below. Mead says:—"The three closely allied species, *edwardsi*, *nevadensis*, and *meadii* seem to be related to each other in much the same way as the eastern *aphrodite*, *cybele*, and *atlantis*. In *edwardsi* the pale submarginal band below is narrower, and sometimes almost obsolete, as in *aphrodite*, and it ranges up to greater elevations than *nevadensis*, which has this band comparatively broad in both sexes, as we see it in *cybele*. *Meadii* differs from either in tint, especially the female; it is somewhat smaller, and probably, like *atlantis*, is exclusively confined to the mountains. The peculiar bright green coloration of the under side of secondaries in *meadii*, however, has no parallel among our fritillaries."

A. callippe is, in its typical form, which occurs all through the lowlands of California, a very distinct species; but *liliana* is, according to Mr. H. Edwards, intermediate between it and *coronis*, and the specimen which he sent me as typical of it does not agree with those which Mr. Godman and I took

abundantly near Los Angeles, some of which Mr. H. Edwards afterwards named *liliana*, though I should certainly call them *callippe*.

A. semiramis, again, is a South Californian form, which has been taken by Mr. Wright in the mountains separating the San Bernadino Valley from the Mohave Desert, and of which I have six specimens from him, as it was not yet out when I visited these mountains in May, 1888. To my eye it is nothing more than a form of *coronis*, in which the black markings on the upper side have become paler and more reduced, as might be expected from the arid character of the country where it is found. Edwards says:—"It is curious how the markings resemble two such distinct species as *adiante* (upper side) and *coronis* (lower side)."

The species allied to *monticola*, namely *zerene* and *bremneri*, have puzzled me quite as much as Edwards, Strecker, and others, and I do not see how the difficulties of their synonymy can ever be cleared up; but I can only say that, if I have not succeeded in arranging them correctly, it is not from idleness or carelessness, but on account of the impossibility of identifying species or forms described in such a way as these have been. Many of the names cannot be certainly identified, and had better be dropped. I think, however, that three more or less distinct forms can be recognized among the very numerous specimens which I have from the Pacific States. These are a larger form *monticola*, and a smaller form, which both Messrs. H. and W. H. Edwards call *zerene*, Bdv. These both vary extremely on the under side, but in *monticola*, the males occasionally, and the females usually, have more or less silvery spots; whilst in *zerene* the duller and paler color of the under side is without any silver except on the marginal row. These distinctions, however, are based upon Californian specimens, mostly from the Shasta district, and, according to Edwards's opinion in 1879 (see *Can. Ent.* p. 55-56), do not apply to Nevada specimens. He then considered *monticola* to be only a var. of *zerene*, but put them down as two species in his catalogue of 1884. Further north, in the damper climate of Oregon and Washington Territory, as also commonly in Vancouver's Island, a darker form, *bremneri*, occurs, which on the under side is well spotted with silver in both sexes, and might be considered as the Pacific coast form of *atlantis*, but in the specimens taken on Mount Hood by Morrison (*rhodope* Edw.), and also occasionally in Vancouver, the silver is absent, and these specimens might well be considered as a northern and darker form of *zerene*.

A. hippolyta, which is also kept up by its author as a species, is described without reference to its allies, and seems to be something intermediate between *hesperis* and some form of *zerene* or *monticola*. Its locality would indicate that it may be nearer to them than to *atlantis*. It was described from four males and one female only.*

*Mr. Strecker informs me that *hippolyta* was de-

A. adiante is a form which both Strecker and Edwards consider distinct, and which appears to be very local. On the coast of California, according to Strecker's information, it is now extinct, and all the male specimens (I have seen no females) in Mr. Godman's and my collection were evidently taken many years ago. But, though the markings on the under side are nearly obsolete in some cases, and in all faint compared with those of *zerene* or *monticola*, yet they seem to be quite identical, and I should certainly be inclined to set it down as a variety of one of those species. This is just a case in which one would be guided by the opinion of local collectors, but neither Mr. H. Edwards or any one else of late years seems to have mentioned this species, and the opinions held twenty-five years ago, when Dr. Behr was an active collector, are not conclusive.

The intricacy and confusion of nomenclature among the next group of Argynnides, which inhabit the Rocky Mountains and Pacific States, is as great as among the last, but I have in this case followed Edwards's identifications of Behr's and Boisduval's species, which are supported by the named specimens sent me by Mr. H. Edwards, rather than the arrangement of Strecker's Catalogue, which makes *montivaga* and *egleis* varieties of *zerene*, Bdv. I cannot, however, follow Edwards in separating *clio* and *artonis* from *eurynome*, and Geddes, who took them in the Northern Rocky Mouutains, agrees with me in considering them as synonyms. As to *opis* and *bischoffi*, I am more doubtful, having seen but few specimens; but in these, as well as in Edwards's figures I can see no specific characters, and should consider them as northern varieties, differing only, as might be expected, in rather smaller size and duller coloration. Whether *montivaga* and its var. *egleis* are really distinct from *eurynome* and its varieties is hard to say; they seem to have the fore wings rather longer and the underside less tinged with green: they may, perhaps, best be treated as the west coast representative of *eurynome*. Edwards says of *egleis* (*Can. ent.* v. 2, p. 54) that whatever the variation in other respects (and he allows it to be very variable), the spots of the second and third rows on the under side of hind wings are heavily edged with black on the basal side. But I have specimens of *montivaga*, collected by Morrison in Nevada (of which sixty were also examined by Edwards), and others from the Sierra Nevada, California, named *montivaga* by H. Edwards and Strecker, which have the same character, and in some specimens of *eurynome* taken by myself in Yellowstone Park, the same black edging is more or less perfect.

I have also specimens of *arge*, Streck. from Strecker and Mr. Holland, both from Spokane Falls and California which are undoubtedly the same as *erinna*, which was described in 1883 as a var. of *eurynome* by Edwards, and in his Cata-

scribed from some small examples of *bremneri*, given by Mr. O. B. Johnson of Oregon, to Mr. Dodge, of Nebraska, who gave them to Mr. W. H. Edwards. Some of the same catch and lot were also given to Mr. Strecker.

logue of 1884 is put down as a variety of *montivaga*. If, therefore, he is himself so uncertain of the true position of these forms, he cannot expect others to follow him blindly, and though many years must elapse before any certain conclusion will be come to, I venture to think that the arrangement I have adopted represents the facts shown by my collection, including about fifty specimens from all the States where the species occurs and from many of the collections which supplied his own materials. If it should eventually prove that the Pacific coast form is not separable from the Rocky Mountain form *montivaga*, it may be better to use the name *eurynome* in preference to *montivaga* or *egleis*, because both Behr's and Boisduval's descriptions which have priority over Edwards's, can only be identified with doubt. My specimens of *montivaga* and *egleis*, all come from the Sierra Nevada, and not from the Mt. Shasta district, where *monticola* and its vars. are so abundant; but local information as to their distribution, in this, as in the other cases, is very deficient.

INSECTS OF BERMUDA. — The Bermuda Islands by Professor Angelo Heilprin contains chapters on the insects, arachnida and myriopods of the Bermudas by Drs. P. R. Uhler, George Marx and the late Mr. C. H. Bollman. Dr. Uhler considers the species already found as almost entirely Nearctic in character but anticipates the discovery of multitudes of Neotropical forms. He does not enumerate the hymenoptera, lepidoptera, and coleoptera and his lists of the hemiptera, homoptera, pseudoneuroptera, dermaptera and diptera include but fifteen species or less than half the number recorded in Mr. J. Matthew Jones's "Visitors Guide to Bermuda." Dr. Marx mentions seventeen species of spiders, describing *Lycosa atlantica* as new. Mr. Bollman notes *Julus moreleti*, *Spirobolus heilprini* n. sp., *Mecistocephalus guildingii*, *Scolopendra subspinipes* and *Lithobius lapidicola* as all the myriopods that have been reported from the Bermuda Islands.

DESCRIPTION OF THE LARVA OF MEGALODACNE FASCIATA, FABR. — COLOR. Body sordid white, with the patches on the segments above piceous; head light brown, mandibles piceous.

HEAD subglobose, small, smooth, shining.

CYPLEUS transverse, about five times as broad as long.

LABRUM somewhat narrower than the clypeus and about twice as long, anterior margin straight with a series of strong hairs; angles rounded; sides slightly oblique.

MANDIBLES short and thick with the apex strongly bifid.

ANTENNAE very short; two jointed; first joint short, and about three times as broad as long; second joint more slender and about twice as long as broad with the apex somewhat rounded.

MAXILLAE elongate, rounded at the apex with hairs and a few bristle-like short tubercles.

MAXILLARY PALPI three jointed; first joint much broader than long; second joint, less wide; third joint more slender and longer.

LABIUM subcordate, apex rounded; base much broader.

LABIAL PALPI two jointed; first joint, short, thick, twice as broad as long; second joint more slender, broader at the base than apex and about twice as long as broad.

BODY elongate, segments all about equal width and length except the first which is

narrower; last segment also narrower and bluntly rounded at the posterior extremity with two very short, pointed tubercles. On each segment is a transversely oblong, rugose, corneous patch divided in the middle by a narrow dorsal line.

LENGTH about 14 mm. WIDTH about 4 mm. Lives in numbers in fungus found on stumps and decaying trees.

William Beutenmuller.

OBSERVATIONS ON SATURNIA Io. — At Lexington, Mass, 3 July, 1888 I found on the upper side of a leaf of false indigo (*Baptisia tinctoria*) a cluster of about fifty (50) eggs. *Shape:* oblong, compressed on two sides. Attached to the leaf by their ends and touching each other by their sides. Arranged for most part in rows. *Color:* white, with black spots on outer end. In some the compressed sides were white, while in others they were partially yellow and in others still there was a black spot on each side. On 4 July I found on the under side of wild cherry (*Prunus serotina*) leaf a cluster of about thirty-four (34) eggs and these had hatched 6 July. The young larvae were brown, with the head much darker than the body. There were four rows of spines, sending out star-shaped clusters of concentric branches.

As observed by all writers who have described these caterpillars, they have an odd way of following each other, like a file of soldiers, keeping their line of march unbroken, even when turning corners.

The first moult occured 13 July, the second 22 July. I have no record of subsequent moults.

On the 20 July I found another cluster of thirty (30) eggs also on the under side of a wild cherry leaf. These hatched 2 August.

Again, 25 July, in the same situation I obtained a cluster of twenty-three (23) eggs. These hatched 1 August.

From these various broods of larvae I raised a large number of imagines, which afforded me a good opportunity of studying the typical and the variational forms. The following are my conclusions: the males differ from one another far less than do the females. In the latter the typical form has the fore wing plum-colored and the central dark spot of the hind wings nearly equidistant from the surrounding dark circle. From the plum-colored form there are several gradations of shade, till we reach a variety in which the fore wings are light brownish grey, with but little of the typical plum color. From the nearly equidistant spot of the hind wings we pass through gradations in which the spot has lost much of its roundness and become nearly contiguous with the circle, on the side towards the outer angle of the wing, till we reach a well marked variety in which the spot is pear-shaped with the small end turned towards the base of the wing, the large end almost touching the outer circle.

While the males present less difference, one from another, there is yet a well marked variety corresponding to that of the female just described. On comparison I find that out of more than thirty (30) females there are only four(4) with the pear shaped spot, while of twenty (20) males there are six(6) with this peculiarity.

Through the kindness of Dr. H. A. Hagen I have examined the specimens of *S. io* in the collection of the Museum of comparative zoology, where I find a very remarkable variety in a male, captured, I believe, by Dr. R. Thaxter at Newtonville, Mass., 27 June, 1870.

In this specimen the anterior wings were in the main typical; but the plum-colored concentric spots were somewhat peculiar, the outer ones becoming parallel lines instead of spots. It was in the hind wings that the aberration was most striking. The violet centre of the dark spot was reduced in size, and the surrounding dark area extended to the circle with only a mere suggestion here and there of the normal yellow belt between the dark spot and the circle. The latter, in its turn, had run over into the yellow belt beyond thus making a highly suffused variety.

It is my desire at some future time to ascertain whether these imaginal variations correspond with any larval peculiarities, and also whether they can be reproduced in breeding.

Holmes Hinkley.

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CONTENTS:

ADVERTISEMENTS 320
THE CORN DELPHACID, DELPHAX MAIDIS.—*William Harris Ashmead* . . 321–324
THE PARTIAL LIFE-HISTORY OF PSEUDOHAZIS EGLANTERINA, WITH REMARKS ON THE LARVAE OF ALLIED GENERA.—*Alpheus Spring Packard* 325–327
THE ARGYNNIDES OF NORTH AMERICA.—*J. J. Rivers* 328–329
DIARY OF A HIBERNATING BUTTERFLY.—*Samuel Hubbard Scudder* . . . 330–332
PALAEARCTIC LEPIDOPTERA 332
NEW TRAP-DOOR NESTS OF SPIDERS.—*J. H. Emerton* 333
OTIORHYNCHUS SULCATUS INJURIOUS TO PLANTS IN GREENHOUSES IN MASSACHUSETTS.—*H. A. Hagen* 333–334
NOTES ON COLIAS EURYTHEME AND C. PHILODICE.—*Elison A. Smyth, Jr.* . . 334

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PSYCHE.

THE CORN DELPHACID, DELPHAX MAIDIS.

BY WILLIAM HARRIS ASHMEAD, JACKSONVILLE, FLA.

As is well known, the rapid changes taking place in the environments of a new country, under the influence of settlement and modern civilization, by the destruction of the forests and the cultivation of the soil, induce corresponding changes in the natural environment of insect life.

The natural food plants of hosts of insects are destroyed, and these are compelled, by the changed conditions, to seek among the plants brought by civilization such food as will sustain existence and perpetuate their species. Under these civilizing transformations, therefore, new insect pests are continually being brought to notice, appearing on some well known crop previously entirely exempt from their attacks, do great injury, cause the planter anxiety, attract the attention of the entomologist, and require skill and prompt measures for their destruction and the saving of a crop.

A new insect pest has lately appeared on corn in Florida, to which I have given the above name, that peculiarly illustrates this point.

It belongs to the family *fulgoridae*, subfamily *delphacinae*, in the order hemiptera, or suctorial bugs, and is apparently unknown to science, although found in great numbers on growing corn in my garden, and on coarse grass elsewhere. Up to the present time, no species in this family, at least to my knowledge, has as yet been described or reported as living on or injuring this cereal in either the United States or Canada.

Many years ago, however, Prof. Westwood, in the annals and magazine of natural history, v. 6. p. 413, published in London, England, in 1841, illustrated and described a species, very closely related to and resembling it somewhat, as seriously destructive to sugar cane in the West Indies; so that, after all, it is not so astonishing that a species in this family should now be found in the United States on so closely allied a food plant.

The "Corn Delphacid" was detected early in July, 1888, my attention being first called to it by the number of ants, *Cremastogaster lineolaris* Say, which were swarming on the leaves and crawling up and down the stalk. Ants never congregate in numbers without cause; and, an examination as to their superabundance at this time soon revealed itself in the discovery of this new corn

pest; for, as is the case when attracted to the aphides, occurring on other plants, they had gone there for the purpose of lapping up the saccharine substance, which, from the punctures of these pests, was exuding in considerable quantity, as a sweet viscid fluid, frequently covering most of the upper surface of the blades, and particularly in notches formed at the basis of the leaf-stalks, where the larvae and maturing insects were found to be fond of congregating.

INJURIES AND LIFE HISTORY.

The injurious affect, of this insect, on growing corn is readily apparent: the depletion of its juices and the saccharine substance on which the young and old feed, so necessary to growth and the maturing of the crop, occurs from the punctures of their beaks, whereby it is stunted in growth and the ears never fully mature; moreover, it is still further injured, scarred and disfigured by the ovipositor or egg-borer of the female, which is used as a saw or borer, to cut into the cellular tissue of the blade or stalk, where she deposits her eggs.

The little cicatrices or scars, thus made, and the depletion of the juices of the plant from the punctures of their beaks, give to it a diseased, sickly appearance, that, in connection with the swarming ants and flies, cannot fail to attract attention.

No delphacid, that I am aware of, has ever been thoroughly worked up in all its stages, and the egg and newly hatched young have never been described or figured; and, as these are peculiarly characteristic and probably of biologic importance, it is particularly gratifying to me, to have been so situated to work up the life history of the present species, and, to be able to present illustrations of their many remarkable peculiarities.

Finding the species so plentiful on corn and grass in my own garden, for some weeks, it was possible to make visits daily, and thus, the opportunity and satisfaction in working up and studying the insect in all its stages —to a naturalist, the greatest of pleasures — was afforded me.

The egg, (fig. a), about 1 mm. in length, is of a greatly elongated shape, narrowed into a more or less distinct neck at base, and of a translucent white color, except a yellow yelk-like spot near the base, shown in the figure as a black dot.

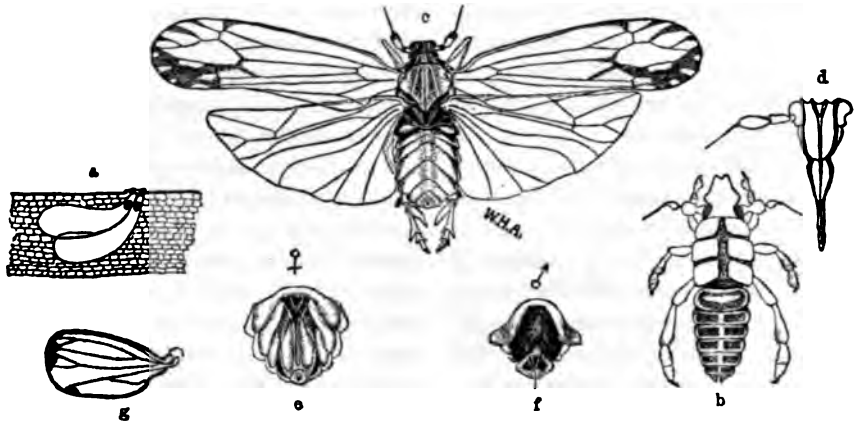
The female makes an incision, with the ovipositor, under the epidermis of a leaf or in the stalk, into the cellular tissue, of a sufficient size to contain two eggs together, as is shown in the figure. After oviposition, the orifice is cemented with a greyish or white glutinous substance that appears externally, on the surface of the leaf or stalk, only as a cicatrice.

The eggs are laid in regular rows, a slight distance apart, and invariably two are found together, never more or less. Hundreds were examined but I always found two together, as illustrated.

The egg hatches in from a week to ten days, and a succession of broods

appear all during the last of July, August and September, the young and old, in various stages of growth, appearing together. Whether the broods appear later than September I cannot at present tell, as my observations on the species were abruptly terminated by the yellow-fever epidemic.

The newly hatched larva is shown in figure *b*. It is of a pale greenish white color and less than 2 mm. in length, and



in some of its characters quite dissimilar to the adult: The head has a remarkable cephalic prolongation, shaped as in the figure; the thorax exhibits dorsally six quadrilateral plates; the abdomen is composed of 7 segments, the basal one being the longest; the middle and anterior tarsi are only 1-jointed, while the posterior tarsi are 2-jointed, the posterior tibiae being without the large movable spur, so characteristic of the adult.

From this stage to the adult there are five distinct molts, after each molt the insect assuming more and more the appearance of the imago; the cephalic prolongation disappears with the third molt, when the frontal carinae are more or less distinctly visible, as well as the three carinae on the thorax, and distinct wing pads appear.

There are two distinct forms of imagos—a perfect winged and a brachypterous form—which are briefly described below, being, it is believed, together with the figure, sufficient to distinguish the species.

Delphax maidis n. sp.

♂ Length 2 mm.; wing expanse 6⅜ mm. Pale greenish-yellow, in death pale brownish yellow; apex of 1st and the apical half of 2nd antennal joints, lower part of frons, spots on pleurae, most of the abdomen, except the 1st ventral segment and the lateral edges of the dorsal segments, smoky black.

Legs pale, the femora more or less embrowned; apex of posterior tibiae with

several black tipped spines and a large movable spur; tarsi 3-jointed, the basal joint longer than the other two together, all with black tipped spines or teeth at apex; the anterior and middle tarsi shorter, the terminal joint the longest, longer than the first two together. Face with three keels, the middle one forked on the frons above; clypeus also tricarinated, the middle carina delicate; beak, apparently, but two-jointed, reaching far beyond the middle coxae, the first joint being slightly the longer. Prothorax and mesothorax tricarinate, those of the last being delicate or subobsolete. Front wings pale greenish-brown, sub-hyaline, the apex of the clavus and veins of apical cells more or less distinctly surrounded by fuliginous clouds, as shown in the figure (c). ♀. Length 2⅜ mm.; wing expanse 7 mm. This sex agrees with the male, except its slightly larger size, the clypeus as well as the frons and all the coxae are more or less distinctly embrowned or blackish, while the apical edges of the abdominal segments, as well as the lateral edges and a broad dorsal stripe, are yellow.

The ventral apical aspect of the two sexes is shown in figures *e* and *f*; the head and antennae in figure *d*.

The brachypterous form measures 3 mm. in length, the abdomen being much broader and more depressed than in the fully winged form.

The aborted wings, shown in figure *g*, are less than 3 mm. in length, with a spot at apex of clavus and two on the apical margin, the venation as in the drawing.

PARASITES.

The species is subject to the attacks of a dipterous parasite and probably also to hymenopterous parasites belonging to the subfamily *dryininae*. A single ♀, unfortunately killed in the cyanide bottle before I discovered the fact or I might have reared it, exhibited peculiar inflated or oval projections issuing from each abdominal spiracle, covered with a dark colored, felt-like skin, which, on dissecting under the microscope, I found each to be the recepticle of a puparium of a dipteron closely allied to, if not, a *Cecidomyia*.

Another year's observations will probably enable me to rear this parasite and settle definitely to what family it belongs and it is only mentioned at this time as an interesting fact in its life history well worthy of record.

THE PARTIAL LIFE-HISTORY OF PSEUDOHAZIS EGLANTERINA, WITH REMARKS ON THE LARVAE OF ALLIED GENERA.

BY ALPHEUS SPRING PACKARD, PROVIDENCE, R. I.

I am indebted to Prof. C. V. Riley for the opportunity of examining the larvae in alcohol of the first stage of this species, which were collected at Manitou, Col. I have carefully compared these with freshly hatched larvae of *Hyperchiria io*. When first hatched the form of the head and shape of the body are as in *H. io*, but the larva is somewhat larger. The generic differences from *H. io* are confined, not to the number and arrangement of the spiniferous warts, but to the shape of the spines themselves, and this makes it evident that in probably all the genera and species of the *hemileucini* of Grote, the spines themselves are especially developed at first with reference to the protection of the young larvae, which huddle together in masses so that their bodies are protected from observation. Later in life the spines are smaller in proportion to the body because more scattered, and then it is that the larvae are protected by the poisonous nature of the spines, the body itself being more uncovered and conspicuous. It is just the reverse of what takes place in the arctians and other larvae which become very hairy or bristly late in larval life, and are sparsely provided with hairs when first hatched. It will also be seen that in respect to the spines the present species when first hatched is much more highly specialized than *H. io*, the latter being more simple and generalized a form as regards the spiniferous warts.

Stage 1.—Length 5 mm. The spiniferous tubercles are arranged, as in *H. io* in eight rows, those of the two rows, one on each side of the median line of the body, and the subdorsal ones being the larger and longer, while those on the side of the body become shorter and smaller as they approach the under side of the body. The spine-bearing warts are larger and swollen compared with those of *H. io*. The dorsal spines on the prothoracic segment* differ from those of *H. io* in having the trunk spinulated, the spinules being long and each bearing a long, tapering hair; the main spine is pale but ends in two long black forks, each tine of which is 2-3 as long as the trunk of the spine itself, while the bristle arising from each fork is as long as the latter. The spines of the two lower rows are spinulate on the trunk but are pale throughout, while the larger ones on the back are dark at the end, being pale at the base. The dorsal spines on the abdominal segments

* In describing caterpillars it is well, especially in those of bombyces, to distinguish the three first segments behind the head as the thoracic; the ten succeeding ones as the abdominal segments.

differ from those of the thoracic segments in having a somewhat verticillate arrangement of the large five or six terminal spinules, all being pale except the terminal one, which is considerably larger than the others.

The single median spines on the 8th and 9th abdominal segments respectively, occupy the same position as in *H. io*, but are larger in proportion and are *not forked* as they are in *H. io;* on the contrary they resemble spines, one being larger and darker than the others; the spine on the 9th segment is a little smaller than the one preceding it.

To recapitulate, it will be seen that the spinulate spines of *Pseudohazis eglanterina* in stage 1 are more complicated than those of *Hyperchiria io* of the same stage, so that the body is more concealed from view. The thoracic dorsal spines are forked but not so simply as in *H. io*, while the median single ones on the 8th and 9th abdominal segments are not forked but more or less densely spined in irregular whorls, with one of the spines larger than the others.

Fully grown larva.—The following description was drawn up many years ago from between forty or fifty alcoholic specimens from the Gulf of Georgia, Cal., in the Museum of comparative zoology. There was no noticeable variation in the lot. The larva is intermediate in its characters and in size between *Hemileuca maia*, which it more nearly approaches, and *Hyperchiria io*. The head is smaller than in either of the two genera mentioned; in the thickness of the body it approaches *H. io* rather than *H. maia*. The shape of the clypeus is much like that of *H. maia*. The dorsal spines are whorled as in *H. maia*. The lateral subdivided or whorled setiferous spines are longer than those of the two dorsal rows, but are not so long as in *H. maia*. The arrangement of the longer spines on the thoracic segments, and on the 8th and 9th abdominal segments are as in *H. maia*, but they are shorter, more bushy and more subdivided. The suranal plate is triangular lunate. The dorsal spines are shorter and sharper than those of *H. maia*, being very sharp and the prick painful even in alcoholic specimens.

The head, body and spines are black; in *H. maia* the head is reddish, in *H. io* amber. There is no special coloration to mark the larva of *H. eglanterina*, the body in alcoholic specimens being uniformly dark.

Larva of 4th stage.—The larva in this stage scarcely differs from that in the last stage, the inequality between the length of the dorsal and upper lateral spines is observed in this stage.

Mr. H. Edwards has described (Proc. Cal. acad. sci., 19 April, 1875), the eggs and the mature larva; he states that it feeds on *Frangula californica* and *Rosa*. He states that the head is black, and the body entirely dull black. "Each segment is armed with six lateral spines, very finely branched, and two dorsal fascicles of spines, bright chestnut

color, blackish in the centre. The branchlets of the spines are all bright chestnut in color. Underside as well as the feet and abdominal legs dull black. Length, 2.00 inches."

It is interesting to compare the generic forms. It is usually impossible to draw up comparative descriptions of caterpillars while living, from the obvious fact that one may only have a single species under observation, alive at one time, and for this reason a collection of carefully preserved alcoholic, as well as of blown specimens is all important; and I may add that for the careful study of structural features I much prefer good alcoholic specimens to blown ones, if the caterpillar has been at first killed in very weak alcohol, and, say, a couple of days later transferred to strong alcohol, so that the body does not become too much contracted, and the coloration faded.

I will now add a description of some alcoholic specimens of *Hemileuca maia* contained in the Museum at Cambridge, drawn up as long ago as 1862 or 1863. They occurred in New Jersey in July and were compared with *Pseudohazis eglanterina*.

It is larger, the head larger and dark mahogany in color. There is the same arrangement of spines, but in *H. maia* they are throughout longer than in *P. eglanterina;* they are much stouter, and are paler at the ends. The surface of the body is marbled with pale flat tubercles. The underside of the body is naked, where in *P. eglanterina* it is somewhat hairy.

At another time I compared mature *H. maia* from Georgia with *H. io*, with the following results. The head in the two genera is of the same size, but in *H. maia* it narrows towards the vertex. The clypeus of the latter genus is a little larger, and the sides bulge out rather than curve in as in *H. io*, and the surface is more sunken. The body is rather more elongated and slenderer than in *H. io*. There is a median dorsal line, and two subdorsal broad bands, dotted with light oval spots in *H. maia*. The suranal plate is elongated lunate, approaching a triangular shape. The sides of the anal lip are thickened throughout, more so than in *H. io*.

Note.—The author would take this opportunity to say that he is collecting materials for a monograph of all the Bombyces with especial reference to complete life histories, to be illustrated by colored plates. He is especially anxious to obtain the eggs of any species of *Gastropacha* as well as the mature larva, also those of any species of *Hemileuca*, *Pseudohazis* and *Hyperchiria* except those above mentioned, and also desires the eggs and larvae of the species of *Euleucophaeus*, *Coloradia* and *Quadrina*.

THE ARGYNNIDES OF NORTH AMERICA.

BY J. J. RIVERS, BERKELEY, CALIFORNIA.

In the February numero of PSYCHE appeared a reprint from the Transactions of the entomological society of London, upon the North American Argynnides by Henry John Elwes. Those who have had the pleasure of studying Mr. Elwes's treatment of the genus *Parnassius* (Proc. zool. soc. Lond. 1886), must have a high and respectful opinion of any other matter upon which he undertakes to write. Mr. Elwes calls this later paper a "Revision" but, it appears to me more like a timely consideration preparatory to a revision. The difficulties in the way of a revision, allow me to say, have not yet been surmounted; the absence of knowledge of the metamorphoses of so many forms prevents a proper understanding of a true relation of one form to the other. The comparative work of the cabinets is frequently of no value through the meagre material and unauthenticated types, observers have to deal with, causing different conclusions even among associates equally able to judge. We must remember, too, that the observers are but ordinary mortals and that nature has thought it a fit and proper thing to place upon the workers in this Western world, a problem that will exhaust the love and energy of the next two generations of lepidopterists, to solve. The insects often differ but slightly from each other, and the variation is frequently not so much in the insects as in the eyes of the investigators. There are some persons who can scarcely see any variation in forms which to another person appears entirely unlike. In the absence of biologic information how are we to be certain of the extent of variation of a species unless each is bred under careful observation?

This is the method now being carried out principally by Mr. W. H. Edwards, the final results being given in accurately drawn figures of all the conditions and changes appertaining to the natural history of each species. It was getting at the life history of *Colias eurytheme*, that furnished the facts that revealed its relation to its seasonal varieties, which before this, had borne specific names; and it appears to me that a like course is the only safe one, if we would know with what we are dealing. Every person who describes an insect supposes that without doubt he is giving the characters of an undescribed new form, and no author ever dreams that his work is only provisional, yet with additional knowledge upon the subject, that is what it frequently proves to be. There is, however, no prevention of this and when the true information is reached these false species simply drop into synonymical line.

Most of us think that we can pen a readable description of an insect, forgetting that the proportion of persons so capable, is very small. Dr. Behr, H. Edwards, W. H. Edwards and H. Strecker besides Boisduval have all dealt with the Pacific forms. Part of their work represents first impresions only, while some of it partakes of the form of digested considerations. Now comes Mr. Elwes who has redigested the investigations of those who have preceded him the conclusions being a general merging of forms and great reduction of species, and all that can be said in favor of this newer treatment is, that it possibly tends in the right direction. Mr. Elwes remarked that he found species difficult to decide about, but that Mr. Edwards got over the difficulty by naming them all separately. What else could he do in an empirical provisional arrangement but to make his skeleton and clothe it as he could obtain the materials wherewith to make it perfect? No! Edwards has got over no difficulties in that way, but he surmounts them by zeal mixed with a deal of honest hard work. Mr. Elwes is inclined to consider *A. adiante* a variety of either *zerene* or *monticola* I on the contrary feel constrained to look upon it as having little relation with either of those forms. Neither *zerene* nor *monticola* have yet been seen in the habitat of *adiante* so that as far as we know, *adiante* is strictly a local form, species or variety, though if they were to occur in company that would prove no unity of species; I take *zerene*, *liliana* and *rupestris* in company (this *rupestris* being *montivaga* Behr), the locality being of a similar nature, in Napa Co. to that which produces *adiante* in San Mateo Co. But Mr. Elwes thinks there is no affirmity between *adiante* and *semiramis*. When speaking to Dr. Behr about *semiramis* he remarked that in all probability it was a southern form of *adiante*. This is a case showing the uncertainty of eye sight. I look upon them as true and distinct and, moreover, I see nothing but the silver to connect *semiramis* with *coronis* but on the contrary I see much in it that reminds me of another and altogether different type. Take examples of the Arizonian *nokomis* male and of *aphrodite* male, of *semiramis* male and of *adiante* male and female, and examine them from above and you will perceive they all possess the same tone of yellow brown and that the hind wings of all have the same style of interrupted bands of black; the peculiar yellowish brown that softly fades toward the hinder part of the hind wings, is unlike any tint seen on any other butterfly found in California except *adiante* and *semiramis*. I shall, for the present at least, keep *adiante* free from all alliances, and the other species, though the richly emblazoned underside of the hind wings is a point of some weight, yet in the midst of so much uncertainty it were better to still inscribe on its label as usual, ***Argynnis semiramis***, W. H. E. than the other which was suggested in Mr. Elwes's paper.

DIARY OF A HIBERNATING BUTTERFLY.

BY SAMUEL HUBBARD SCUDDER, CAMBRIDGE, MASS.

Doubtless in acknowledgment of the honor just conferred upon it by giving it a new and euphonious name in my "Butterflies of the Eastern United States," a fine specimen of *Euvanessa antiopa* came to pass the winter with me, taking up its station in the cellar directly beneath the room where the Cambridge Entomological Club holds its meetings. It was first noticed about the middle of November, before the cellar windows had been closed for the winter. It was then pitched on the top of the cellar-wall where this was exposed in the passage-way down stairs. For fear of its falling a prey to the mice which had been seen here, it was driven away, when it at once took up its station about eight inches above the cellar floor on the "riser" of the first stair, just beneath the projecting edge of the first "tread," the extremity of its wing projecting beyond the tread. Here it remained all winter, until the last days of February, not, however, without moving; the position of the wings was marked with a pencil on the edge of the tread, and it was found to have shifted its position repeatedly — some six or eight times — sometimes forward, sometimes backward, within a range of about an inch; about the middle of January its position changed from perfectly horizontal to slightly oblique, the head downward, and on the very morning of the day it left the station it was noticed to have shifted a very little more, increasing its obliquity. During all this time the wings were kept in an identical position, back to back, the fore wing thrust forward just so much as to bring the tooth at the tip of the lower median nervule of the fore wing exactly midway between the subcostal tooth of the same wing and the tooth of the upper median nervule of the hind wing. This is exactly the position of complete repose in summer. The station chosen was a curious one, being *directly* beneath the spot where the right foot, always first advanced, was placed upon the first tread, and a movement of air must at least have been perceptible to it whenever one went upstairs or down, but in only a single instance was any apparent agitation produced; this was when the cellar doors ten feet away from it were opened, on a tolerably cool day, and for three hours men were passing back and forth bringing in wood; then a slight vibration of the wing-tips was seen, but no sound could be detected.

In a wintering *Polygonia* observed by Goossens in Paris, the fore wings responded to the warmth of the weather by creeping forward and backward between the hind wings a very little, with-

out any other noticeable movement. This I was unable to detect in *E. antiopa*, perhaps because the cellar temperature would not vary nearly so much as the outer air, especially as it contained a furnace at about twenty-five feet distance; but particular attention was paid on the coldest and warmest days without detecting any difference of position of the wings. What the cause of the slight forward and backward movements might be was not discovered; it seemed to have no relation to the weather or to the amount of light. It may be added that until the position became oblique the wings were held horizontally with a scarcely perceptible tip upward toward the "tread," the legs on the upper side being bent slightly more than those on the lower side; but when the oblique shift was made, the tip was very slightly increased, to about ten degrees in all.

It finally flew to a small window about six feet above its hibernating post, where it was found at about 2 P. M. on 28 February, having left its winter quarters since 1 P M. It was in a curious position: it had evidently alighted on the vertical surface of the lower sash, head upward, and had lost its hold, the smoother surface not permitting its claws to hold so well as in its hibernating station, and had fallen backward upon the top of the ledge an inch or two beneath, and there remained upside down, balanced on the top of its erect wings, the margins of the hind pair spreading by the weight and so preventing it from tipping over; in this strange position, feet upward, where a mere breath of air would have thrown it over, but from which it could free itself only by flapping its wings, it remained for more than an hour, but by about 3 P. M. was found to have righted itself and pitched with erect wings, head downward, on the cellar wall a few inches away.

February 28 was a cloudy, cool day with rain, the thermometer at the time of its flight about 42°. In the cellar it was about 48°–50°. The only time that the outer air had free access since the closing of the windows late in November was when the wood was brought in early in February.

The butterfly remained in the position it had taken on the afternoon of 28 February until about noon of 5 March. During the warmer days when the rays of the sun fell directly on the apical half of the wings, it would thrust its antennae forward at an angle of about 45° with each other and at an angle with the costal edge of the fore wings of about 35°; at other times the antennae were kept between the fore wings out of sight, just behind the costal margin, as I found out by parting the wing-tips carefully without in the least disturbing it. It shifted its position slightly from day to day much as it had done on the stair, but retained practically the same foothold with which it had alighted. I had to pass the place more than a dozen times a day, my shoulder within a foot of the butterfly, but the only effect

shown was when the antennae were extended as if alert. Then my presence near at hand or my passing would be recognized by a rocking or bowing motion of all the wings in common, produced, apparently, by the action of the middle legs in lowering and raising the body upon the pivot formed by the insertion of the hind legs; the tips of the wings moved slowly forward and backward, the forward motion more abrupt than the backward, over an arc of not more than a quarter of a centimetre; the motion was accompanied by no perceptible sound.

On the 5th, a bright, warm day, the butterfly had turned back to the window at about noon, and my appearance led to some fluttering against the pane. As I remained motionless, it gained heart, walked about the broad ledge beneath the window with open wings and antennae spread at right angles, with every few steps depressing them like stiff sticks till they touched the ground, beating time, as it were, with its march, and, finally, took up its position on the ledge, and turning its back to the sun, expanded its wings fully, even depressing them so that the tips touched the surface of rest; the antennae retained the alert position of the day before. Wishing to see what would happen I moved from my position directly opposite the window, my head about three feet away, toward the butterfly, but as slowly as possible. No effect was produced until my eyes were within a foot of the butterfly facing me, when its wings shut with a snap and then began to vibrate; the tips of the wings appeared to have a lateral vibration of not more, probably considerably less, than a couple of millimetres, while the antennae vibrated forward and backward as much as laterally, and not over a millimetre. I could perceive no sound whatever. I slowly turned my head to bring my ear opposite, but could still detect nothing. On endeavoring to bring my ear still nearer by the quietest possible approach, the butterfly flew again to the window and fluttered about. Subsequently, I got within six inches and could then distinctly hear a rustle like the flapping of the wings of an insect against a window pane at a distance, and could see that there was not the slightest motion of the fore wing on the hind. It afterwards partook so greedily of some half-rotten apple offered it that it permitted me to hustle it about with my finger without apparent fright.

PALAEARCTIC LEPIDOPTERA. — The celebrated collection of PALAEARCTIC LEPIDOPTERA made by the late PROFESSOR HEINRICH FREY, of Zurich, is offered for sale.

The collection consists of 4404 species and 15,600 specimens, all in excellent condition. It occupies 100 corked and glass-covered drawers, contained in three cabinets. The collection will always have a high scientific value as it contains the types of all the new microlepidoptera described by Professor Frey. There are about 80 of these of which *about 50 are unique*.

For further information apply to DR. MAX STANDFUSS, MUSEUM DES POLYTECHNICUM, ZURICH, SWITZERLAND.

New Trap-door Nests of Spiders.— In two recent papers, Arachnides du Venezuela, (Ann. soc. ent. de France, 1889, v. 9) and Aviculariadae du Nord de l'Afrique, (Actes soc. Linnéenne de Bordeaux) E. Simon describes and figures a number of new nests of *mygalidae*. Among the Venezuela species, *Pseudidiops opifex* makes a short tube with trap-door on branches of trees. The tube is attached to the bark by one side and covered with bits of bark and lichens. *Stothis astuta* makes a short tube with a trap-door at each end. sometimes the tube is among loose rubbish on the surface of the ground and is then straight. In other places where the soil is more solid it burrows obliquely below the surface, carries the tube a short distance just under ground and turns it up again to the surface. *Rhytidicolus structor* makes a nest of three distinct chambers connected by narrow openings both closed by trap-doors, the one between the first and second chambers opening inwards. The cocoon is flat and is hung across the outer chamber. *Psalistops melanopygia* makes a tubular burrow, lined partly with silk, and with a branch near the upper end like many other species, but with no trap-door, and conceals the mouth of the tube with leaves and rubbish. *Epipedesis opifex* makes a simple furrow on the surface of the ground under a stone or moss and covers it with silk.

Among the African species *Leptopelma cavicola* makes a branched tube without any trap-door. *Dolichoscaptus latastei* carries its tube with trap-door ten centimeters above the surface of the ground making it stiff with bits of dirt and leaves fastened with silk to the outside. *Dolichoscaptus vittatus* was found in several cases to bore at the bottom of its burrow a short tube too small for the spider, filled with the remains of insects that it had eaten. *Dolichoscaptus artifex* makes a very peculiar,complicated burrow. At the mouth it has the usual flat trap-door. A short distance below the surface the burrow is enlarged into a spherical cavity in which works a door of a different kind. It consists of a lump of dirt covered with silk, shaped like half an egg with the edges rounded off and large enough to half fill the spherical cavity. When turned with its longest diameter vertical and its convex side against the wall of the cavity it leaves room for the spider to pass on the opposite side from the upper to the lower part of the burrow. When turned with its longest diameter across the burrow it closes it completely. To complicate this arrangement still more, a flexible tube of silk, continuous with the lining of the lower part of the burrow and open at the top, is attached along the flat side of this door so that when the door is open the spider passes up or down through this tube, and when the door is closed the tube is flattened against the side of the burrow.

J. H. Emerton.

Otiorhynchus sulcatus injurious to plants in greenhouses in Massachusetts.—Mr. W. M. Corving of West Roxbury wrote me 5 March, 1889, that the Cyclamens in the greenhouses of the Messrs. Fisher Brothers of Montvale, Mass., were seriously injured by a beetle. The injuries were confined chiefly to the flowers but sometimes the bulb was destroyed. The leaves being hard and leathery escape injury. Mr. Corving sent me a specimen which proved to be the well known European weevil *Otiorhynchus sulcatus*, the existence of which in Massachusetts has been known for a very long time. Dr. Horn gives as localities Massachusetts, Canada, Newfoundland and Nova Scotia; all of these are represented in the Leconte collection. The general collection of the Museum contains two specimens from Europe (Ziegler collection) and six specimens collected in Cambridge in 1872 by Boll. I was interested to know when and by whom the beetle was first recognized here. Schoenherr (Curc., 1843, v. 7, p. 371) gives *O. apiculatus* Say Mss. as a synonym of *O. sul-*

catus. Harris in his catalogue (second edition 1835) has first mentioned Say's species and in his manuscript catalogue records receiving the same from "Doct. Gould, another from Dr. Smith." This entry is inserted between specimens collected in May and June, 1831. Prof. Riley in his third Missouri report (1871 p. 11) states that the species infests the crown of strawberries but does not say where it was observed. Provancher speaks of the species as "très commune." Lintner in his second report (1885 p. 51) mentions it as injurious to bulbs and house-plants. I do not find the species recorded west of Pa. In the European literature it is mentioned everywhere and the early stages are described by Bouché, Westwood, Lucas and others. *H. A. Hagen.*

NOTES ON COLIAS EURYTHEME AND C. PHILODICE.—In the vicinity of Charleston, S. C., where most of my observations have been made, *Colias eurytheme* is the characteristic type. I may say, in fact, that it is the only member of the genus that I have ever seen on the seaboard. It is as plentiful there as *C. philodice* usually is in its proper range, though not seen, as far as I know, in the countless hordes in which the latter is said to congregate at times. In Clarendon County, S. C., where I have collected, off and on, for a good many years, *C. eurytheme* was not as abundant as on the coast, *C. philodice* not found at all, and *C. caesonia* taken occasionally. In Ashville, N. C., where *C. philodice* is very abundant, I have never seen *C. eurytheme;* and *C. caesonia* but once. Spartanburg County, S. C., is the highest locality in which I have yet found *C. eurytheme.*

I have never seen *C. philodice* at all in South Carolina until this autumn; at which time I was enabled to do considerable collecting in Columbia, a locality where I had never collected before. Here I found *C. philodice* and *C. eurytheme* occurring in equal and considerable abundance, and this spring I meet *C. philodice* and *C. ariadne* in about the same proportion. I have noticed a decided difference of manner between the two; *C. eurytheme* being much swifter in flight, its stop at a flower less prolonged, and its whole manner more decided; and it is also much more wavy and therefore more difficult to catch than *C. philodice.* In this respect, my experience is, to use an equation, that *C. philodice: C. eurytheme :: C. eurytheme : C. caesonia.*

Our normal spring form of *eurytheme* is *C. uriadne.* I have taken, this past January (12th to 24th et seq.) a large series of *C. ariadne*, which are, on the average, identical with forms from Texas, and show no marked variation from a few that I have from Wisconsin. A pretty full series of western *C. eurytheme* in my collection, consisting of specimens from five states, from Wisconsin to California, present no marked difference from our autumn *eurytheme;* possibly in one or two cases, the western form may be a trifle more irridescent than our average; but I have one July ♂ taken in Charleston, that is fully as rich in color, as any that I possess from the west. I notice among these western forms some that appear to me to be unmistakably *C. keewaydin:* this form I have not taken here, though I have a few *C. ariadne* from Charleston that are very large and yellow and seem to intergrade with *C. keewaydin.*

The autumn ♂♂ of *C. philodice* taken in Columbia are much larger than northern forms of the same in my collection from Princeton, N. J. We have a spring form of *C. philodice*, bearing the same relation as far as size is concerned, to the autumn *C. philodice*, that *C. aridne* bears to *C. eurytheme.*

In the city of Charleston, I have taken the eggs of *C. eurytheme* from white clover, as they were laid by the female.

The white ♀♀ of both *C. eurytheme* and *philodice* I have taken here, in Columbia, in spring and autumn.

C. caesonia, the only other of the genus found with us, is by no means abundant, though not infrequent last autumn. I captured six in Columbia, in October and November, 1889. *Elison A. Smyth, Jr.*

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CONTENTS:

ADVERTISEMENTS 336
DESCRIPTIONS OF SOME NEW NORTH AMERICAN DOLICHOPODIDAE.—*William M. Wheeler* 337–343
NOTES ON THE STRUCTURE AND HISTORY OF HAEMATOBIA SERRATA.—*John B. Smith* 343–347
NOTES ON THE SOUTHERN DISTRIBUTION OF SOME COMMON BUTTERFLIES.—*Ellison A. Smyth, Jr.* 347–348
THE GENUS ARGYNNIS 348
HABIT OF VESPA.—*T. D. A. Cockerell* 348

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PSYCHE.

DESCRIPTIONS OF SOME NEW NORTH AMERICAN DOLICHOPODIDAE.

BY WILLIAM M. WHEELER, MILWAUKEE, WIS.

Since the publication in 1864 of Loew's admirable Monograph of the North American *Dolichopodidae*, very little work has been done on these interesting diptera. Baron v. Osten Sacken in his "Western diptera," published in 1877, described from California nine new species, belonging to the genera *Hygroceleuthus*, *Dolichopus*, *Tachytrechus*, *Liancalus*, *Scellus* and *Polymedon*. The last is a new and very peculiar genus. Mik, in 1878 (Verhand. d. zoolog. bot. gesell. p. 617-632) described one new North American species for which he erected the genus *Hypocharassus*. More recently, in 1888, Bigot (Bull. soc. ent. France XXIX, XXX) has described eight new species from Hayti, Mexico, North Carolina and California, representing several new genera.

Barring these contributions, our knowledge of the North American *Dolichopodidae* has made no advance since Loew's time. This is not to be attributed to inattention on the part of living dipterologists, but rather to the thoroughness of Loew's work. From a taxonomic standpoint little is left to the ἐπίγονοι besides the filling out of the unavoidable gaps in the work of the master entomologist.

Like other students of our diptera, who have given some attention to the *Dolichopodidae*, I can add very little to Loew's work. With three exceptions the species here described fall naturally into genera defined and adopted by Loew. For these three exceptions I have erected two new genera, *Peloropeodes* and *Aphantotimus*, based, I believe, on sufficiently distinctive characters. The former, including as yet only one species, *P. salax*, is allied to *Rhaphium;* the latter, to which I assign two species, *A. willistoni* and *A. fraterculus*, is allied to *Chrysotimus*. *Peloropeodes* is interesting as forming a link between those higher forms, which, like *Dolichopus*, have large disengaged hypopygia and the genera like *Rhaphium*, *Porphyrops* and its allies, which have the third antennal joint elongated, tapering, with apical arista, and the hypopygium small and more or less imbedded. *Aphantotimus* appears to

form a similar link between the *Dolichopus*-like forms and the species of the genus *Chrysotimus*.

DOLICHOPUS ALBICILIATUS, Loew. ♂.

Length 6 mm.; length of wing 4. 5 mm.

Face narrow, covered with silvery white dust. Antennae black, third joint small, rounded anteriorly. Front dark bluish green; cilia of the superior orbit black, those of the inferior orbit pale yellow. Thoracic dorsum shining dark metallic green; pleurae black, anteriorly, with greenish bronze reflection, posteriorly dusted with white. Tegulae with black cilia. Scutellum dark green with violet reflection. Abdomen dark bluish green, the terga of the first and second segments with violet reflection; incisures broadly black; venter black, powdered with white dust; hypopygium black, opaque, with pale dull yellow lamellae of subtriangular outline, apical margin rather evenly crenulate, broadly bordered with black and fringed with delicate long hairs; penis and other appendages pale yellow. Coxae opaque black, tipped with yellow; the anterior pairs with several curved black bristles on their fore faces; all the femora black, with metallic green reflection, broadly tipped with yellow; anterior tibiae pale yellow, with black setae, which are conspicuously long on the fore pair; anterior tarsi pale yellow, blackened from the tip of the first joint; hind femora ciliated with long and delicate hairs on their inner faces; hind tibiae slightly incrassated, pale yellow with their apical third black; hind tarsi black, the metatarsal joint slightly incrassated. Halteres dull yellow. Wings grayish hyaline; veins black; the juncture of the first logitudinal vein with the costa thickened, though not to the degree observed in the males of some allied species; last section of the fourth vein appearing considerably steeper than in the ♀ and meeting the costa nearer the end of the third vein.

HABITAT: Wisconsin.

Only the female of *D. albiciliatus* was known to Loew. In view of the fact that the male is from a taxonomic standpoint by far the more important sex in the study of the *Dolichopodidae*, I have in this as in the case of a few of the other species, of which the males were unknown to Loew, inserted a description.

DOLICHOPUS INCONGRUUS, n. sp. ♂.

Length 5 mm.; length of wing 4.75 mm.

Dark metallic green. Palpi black; face narrow, silvery white. Antennae large, entirely black, the two basal joints short and small; third joint unusually large, flattened, suboval, dorsal contour straight with the arista inserted near its middle, ventral contour evenly rounded. Pubescence of the eyes distinct, white. Cilia of both the superior and inferior orbits black. Front and thoracic dorsum deep metallic green, the latter with a cupreous reflection in the median line and on its humeral edges; pleurae black, dusted with white. Tegulae yellow with yellow cilia. Scutellum and abdomen deep metallic green varied with cupreous; venter black, covered with white dust; hypopygium large, swollen, black with metallic green reflection and white dust; penis and internal appendages yellow; lamellae small, elongate oval, tapering but rounded at their tips, edges black, scarcely jagged and fringed with short and weak black hairs. Coxae black, and like the pleurae, dusted with white; apical third of the anterior face of the fore coxae and tips of the posterior coxae yellow; the usual tufts of black hairs on the anterior faces of the fore and median pairs and a single backward directed seta on the lateral face of the hind coxa. Fore legs yellow; the basal two-thirds of the femora black; tarsi about as

long as the fore tibiae, plain, being neither attenuated nor infuscated. Median legs pale yellow throughout; femora with preapical bristle. Hind femur eciliate, black, with yellow tip and with preapical bristle; tibia setose, not incrassated, with its anterior face and tip black, its base and posterior face yellow the latter with five prominent setae; tarsi entirely black. Halteres yellow. Wings gray, hyaline; the venation resembling that of other dark-legged species of *Dolichopus;* costa presenting a short but distinct swelling at the juncture of the first longitudinal vein; this swelling does not interrupt the straight outer contour of the costa but bulges out distinctly on its inner edge; veins black posterior cross-vein forming right angles with the fifth longitudinal vein. The base of the wing is rather acute.

HABITAT: Milwaukee Co., Wis.

This species is to be admitted to the group comprising Loew's *D. pachycnemus* and *brevipennis*, both of which are characterized by having the cilia of the inferior orbit black, while the prevailing color of the legs is yellow. The male *incongruus* differs from the males of both of Loew's species in having the tegular cilia yellow, in the coloration of the legs, in having the fore tarsi plain and the hind femora eciliate. There are several other differences but these will suffice to separate the species.

DOLICHOPUS SCOPARIUS, Loew. ♂.

A male agreeing closely with Loew's description of this species was sent me from Mass. by Mr. S. Henshaw. The hypopygial lamellae were so nearly destroyed in the single specimen from which Loew's description was taken that he could only affirm that they were yellow. In my specimen they are well preserved and very unlike the hypopygial lamellae of other species of *Dolichopus* known to me. They are rather large, entirely pale yellow, of a rhomboidal shape, and have their somewhat swollen edges smooth and entire, not jagged as in other species. The upper (or when the hypopygium is flexed back in line with the abdomen, the under) edge is slightly twisted, folded in and fringed with delicate black hairs, which I take to be the homologues of the ragged fringe so characteristic of most species.

DOLICHOPUS FLAGELLITENENS, n. sp. ♂.

Length 5 mm.; length of wing 4.5 mm.

Rather dark metallic green. Palpi yellow, black at their tips. Face about the normal breadth for a male, overlaid with yellowish gray dust. Antennae of medium size; first joint yellow, with the usual black hairs conspicuous; second joint yellow with its dorsal half black; third joint small, rounded, black, blunt anteriorly; arista rather robust, blackish with short white pubescence. Front metallic green with coppery reflection; cilia of the inferior orbit short, yellow. Thoracic dorsum dusted in front with white, the median line coppery; humeral callosity concolorous with the dorsum. Scutellum with a large coppery spot on each side of the median line. Pleurae dull metallic green dusted with white posteriorly. Tegulae with black cilia. Abdomen with coppery reflection; venter overlaid with white dust; hypopygium black, lamellae of moderate size, suboblong, white, upper edge infuscated and fringed with rather weak black hairs. Fore coxae yellow, blackened only at their bases; beset in front with several long and conspicuous black setae; posterior coxae concolorous

with the pleurae, their tips only yellow; the median pair fringed, like the fore pair, with black setae. Legs yellow; fore tibiae provided with a few prominent black setae; tarsi 1½ times as long as the tibiae; first and second joints attenuated, stalk-like, both together equalling the tibiae in length; second joint thinner than the first and about ⅔ as long; third and fourth joints of about equal length, both together about half as long as the second joint. The fourth joint, which is yellow at its extreme base, but otherwise black, is broader than the third joint; fifth joint flattened out into a large oval black disk, densely fringed on its anterior edge with short black hairs and provided with a small and inconspicuous tuft of silvery hairs near the insertion of the claws. Median femur with a preapical bristle; tibia with rather prominent black spines; tarsus plain, blackened from the tip of the first joint. Hind femora eciliate, with preapical bristle; hind tibiae distinctly incrassated; apical half black; setae prominent; a rather dense covering of shorter black hairs, especially on the inner face, which presents a smooth streak longitudinally coextensive with the black coloring; hind tarsi black, metatarsal joint a little thickened; its extreme base yellow. Halteres yellow. Wings more brownish than grayish hyaline; veins dark brown; costa slightly thickened where it meets the first longitudinal vein; fourth vein presenting the usual double flexure; posterior cross-vein meeting the fifth longitudinal vein at right angles.

HABITAT: Milwaukee Co., Wis.

This species is related to several North American dolichopodes. In general appearance it approaches *D. batillifer*, Loew, from which it may, however, be very readily distinguished by the color of the antennae, tegular cilia and hind femora. The dilated fifth tarsal joint of the fore foot is in my species deep velvety black, whereas in *batillifer* it is more brownish and covered with minute silky hairs which make it resemble a silver reflector when viewed from the proper angle.

In the color of its hind tarsi *D. palaestricus*, Loew, approaches *flagellitenens* more closely than does *batillifer*. Loew's species, however, has entirely black antennae, pale tegular cilia and entirely yellow hind tibiae. Both *batillifer* and *palaestricus* have the hind femora ciliated, the former more abundantly, the latter less so, while the hind femora of *flagellitenens* are eciliate.

DOLICHOPUS HENSHAWI, n. sp. ♂.

Length 5—5.5 mm.; Length of wing 5—5.5mm.

Metallic green, changing to coppery and violet. Palpi pale, blackened at their ends. Face rather narrow, overlaid with ochre-yellow dust. Antennae small, reddish yellow; basal joint smooth on its under surface, the black hairs on its upper surface, as also those on the second joint, stiff and rather conspicuous; third joint small, smooth, not much flattened, ending in a short, acute point; apical half black; arista robust. Front metallic violet, moderately shining; cilia of the superior orbit black, those of the inferior orbit yellow. Thoracic dorsum resplendent coppery green, passing into violet on the scutellum; pleurae metallic green, subdued by a layer of silver gray dust. Cilia of the tegulae black. Abdomen with resplendent cupreous reflection especially in the median dorsal line; hypopygium black with dull metallic green base, and pale yellow lamellae and internal appendages; the former are quite large and shaped like isosceles triangles with rounded angles; the two sides forming the apical angle by which the lamella is attached are not infuscated though fringed with a few short and weak yellow hairs; the two other angles are narrowly

blackened and fringed with rather coarse black bristles as is also the side included by them. Fore coxae pale yellow, their extreme base, only blackened; posterior coxae for the most part concolorous with the pleurae and covered with the same silver-gray dust; on their tips, however, this dark coloring passes into pale yellow. The anterior coxae are covered on their fore faces with black hairs, some of which are long and conspicuous, though a greater number are short and evenly distributed.

Legs pale yellow; apical sixth of fore tibia somewhat incrassated, blackened and provided with several prominent flattened black hairs on its anterior face. These hairs are so graduated in length as to make the tip of the tibia seem more incrassated than it really is. Fore tarsus 1½ times as long as the fore tibia; first joint about ½ as long as the tibia, blackened at its tip, its base on the anterior side bared of the small black hairs which cover the joint; hence, at first sight, this joint seems to have a pale spot where it joins the tibia; second joint somewhat longer than the third, second and third together about equal to the first joint; fourth joint about a third as long as the preceding joint, black, except at its base, and somewhat broader than any of the preceding tarsal joints; fifth joint considerably dilated, flattened, oval, dark brown, fringed with short black hairs on its outer edge. The claws are inserted on the middle of the inner long side of the oval; hence the dilatation of the fifth joint has not taken place, as in some other species, at right angles to the long axis of the tarsus, but obliquely. Median femur with preapical bristle; median tarsi dark brown or black from the tip of the first joint. Hind femora with short preapical bristle, ciliated on both their anterior and posterior edges. The posterior cilia are black, very long and form a series extending nearly the entire length of the posterior face; near the base of the femur, however, they become much shorter and pale yellow; the cilia of the anterior edge are all black, much shorter and occur only on the basal half of the femur. Hind tibiae somewhat incrassated with infuscated tips; the usual setae are long and conspicuous; on the inner face a dark brown band runs from the insertion of the tibia to its middle, where it ends in a point; the infuscated tip of the tibia sends out a much shorter dark brown band which stops before reaching the basal band. Hind tarsi deep black, the metatarsal joint a little thickened. Halteres honey yellow. Wings uniformly grayish hyaline with brown veins; costa slightly thickened where it meets the first longitudinal vein; fourth longitudinal vein not broken, but exhibiting the usual double flexure; posterior cross vein meeting the fifth longitudinal vein nearly at right angles.

HABITAT: Massachusetts.

This species may be easily distinguished from all described North American species of *Dolichopus* by the peculiar coloring and conformation of the fore feet. The descripiton is taken from three males sent me by Mr. S. Henshaw.

DOLICHOPUS GERMANUS, n. sp. ♂. ♀.

♂ Length 4.—5 mm.; length of wing 4.—4.5 mm.

Metallic green, not very bright. Palpi pale yellow, face rather narrow, silvery white. Antennae of the same shape as in *D. variabilis*, smooth, red; first joint rather long, cuneate; second joint short and broad; third joint of moderate size, about as broad as long; apical half infuscated, ending in a short but acute point; arista inserted on about the middle of its dorsal contour. Front subdued metallic green; cilia of the superior orbit black, on the inferior orbit dirty white. Thoracic dorsum metallic green with a golden reflection, dusted in front with yellowish scales; pleurae metallic green, becoming pearly from a covering of white

dust. Cilia of the tegulae black. Scutellum concolorous with the thoracic dorsum. Abdomen metallic green, passing into cupreous on the apical half; venter dusted with white, its short hairs pale yellow; hypopygium large, black, with metallic green reflection on its basal half, thinly covered with white dust; penis and internal appendages pale yellow; lamellae white, of moderate size and irregularly trigonal shape; apical margins rather broadly bordered with black and broken into a jagged fringe of bristles, which seem to be white with black bases. From the posterior edge of each lamella projects a broad, flat, bifurcate bristle. Coxae and legs pale yellow; the latter dusted with silvery white dust. Fore coxae covered with short white hairs anteriorly and bearing several conspicuous black bristles near their tips; the median coxae have, besides a few long and curved black hairs on their anterior faces, a long and straight black seta on the lateral face near the tip and a brown spot at the base; hind coxa near its tip with a black bristle which is only about $\frac{2}{3}$ as long as the corresponding one on the median coxa. Fore tarsus plain, about $1\frac{1}{2}$ times as long as the fore tibia, the last joint but very slightly, if at all, dilated, black, contrasting with the pale yellow of the other tarsal joints. Posterior femora each with a prominent preapical bristle; the hind pair eciliate; the black bristles of the posterior tibiae well developed and conspicuous; median tibiae with four equal setae at their tips; posterior tarsi blackened from the tip of the first joint; usually on the median pair the second joint and the tip of the first are more dark brown. Halteres pale yellow. Wings hyaline, with a brownish tinge; narrow at their bases and somewhat pointed at their apices; veins yellow; one or both of the angles of the double flexure in the fourth longitudinal vein somewhat more acute than in many species of *Dolichopus*. The posterior cross-vein, though perpendicular to the fourth longitudinal vein, forms an angle less than 90° with the fifth longitudinal vein.

♀. Length 4.5 mm.; length of wing 4.5 mm.

Face twice as broad as in the male. Third antennal joint infuscated to a less extent and ending in a slightly shorter and blunter point. The terminal joint of the fore tarsus seems to be a little narrower than in the male, though it is also accentuated with black. Otherwise the female very closely resembles the male.

HABITAT: Milwaukee Co., Wis.

I have examined 15 males and 18 females of this species and, with a single exception, find the coloring approximately constant as I have described it. The species is closely allied to Loew's *D. variabilis*, in whose company I have several times taken it. The males of the two species may, however, be readily separated by attending to the following points:

D. variabilis: Face yellow; cilia of the tegulae yellow; fore tarsi blackened from the tip of the first joint; hind femora ciliated.

D. germanus: Face white; cilia of the tegulae black; only the terminal joint of the fore tarsi black; hind femora eciliate.

The pale hairs on the venter of the male specimens of *variabilis* in my possession are very much longer than in *germanus*. The hypopygial lamellae, too, have a different outline and more jagged edge with several flattened bifurcate bristles. The females of the

two species differ, as is the rule in the genus, much less than the males. The female *variabilis* has pale cilia on the tegulae and the fore tarsus blackened from the tip of the first joint, whereas the female *germanus* has black tegular cilia and only the terminal joint of the fore tarsus black. I have seen one female, the exception above alluded to, that had half of the tegular cilia yellow, and half of them black.

I am quite certain that the female *germanus* was known to Loew. He says, after mentioning the fact that *D. variabilis* is more variable in the coloring of the posterior tarsi than is usually the case with the species of the genus *Dolichopus:* "I possess also some other females which I can only distinguish from the above described ♀ of *D. variabilis* by their black ciliated tegulae. It seems therefore that either the females vary in the coloring of the cilia, or that we have here two exceedingly similar species." Loew with his usual care and circumspection did not venture to describe these females as a new species.

(To be continued.)

NOTES ON THE STRUCTURE AND HISTORY OF HAEMATOBIA SERRATA.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

During the summer of 1889 the alarm occasioned by the appearance in excessive numbers of this species, known as the "Horn Fly," induced me to study some of the structures rather carefully to demonstrate the impossibility of injuries such as were charged to the fly. The result of these studies appeared in popular form in Bulletin 62 of the New Jersey Experiment Station, and as they cover some ground not heretofore trodden, I give some of them in a more technical and condensed form to the entomological public.

The mouth parts were more particularly studied — not so carefully as the studies made on some other species by Dr. Dimmock, but simply to show the gross anatomy. In this species the opercular sheath is a ringed structure, enlarged basally and roughly shaped like an "Indian Club." The tube is not complete, but there is an infolding above and in front of the sheath which, while making it practically tight, gives a wide range of motion in enlarging and and contracting. On the outer side this sheath is furnished with rather sparse hair set into deep pits, evidently tactile and specialized, and not mere pubescence. In general structure *Stomoxys calcitrans* which was studied

comparatively, agrees with the present species so far as the sheath is concerned.

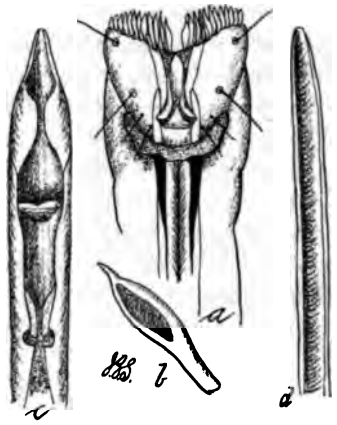

FIG. 1.

Toward the tip the sheath becomes narrower and more closely infolded until just below the labellae a chitinous, curved, cross piece unites the two sides and makes the tube complete. Chitinous rods, quite heavy at their point of inception at this cross piece run upward close to the margin of the incurved edges, gradually losing themselves in the body of the sheath. *S. calcitrans* has a very similar structure. The extreme tip is somewhat tumid, smooth, set with a few tactile hairs and furnished toward the back with a series of fleshy processes which are apparently sucker discs, being hollow with an oval opening at the side near the tip. Centrally there is an elongate, somewhat trigonate opening, with corneous edges through which the hypopharynx (lancet) and perhaps the canula (lancet sheath) are extended when the insect pierces its prey; the soft lips with the fleshy suckers form a close union with the punctured surface.

S. calcitrans differs very decidedly in the structure of the tip, the lips not being tumid while the edge is completely encircled by the sucker discs.

The canula or axis piece or lancet sheath, carries the hypopharynx or true lancet. It is rather more than half a cylinder to near the tip, where there is a beautiful adaptation to hold and stiffen the lancet. The open sides of the canula

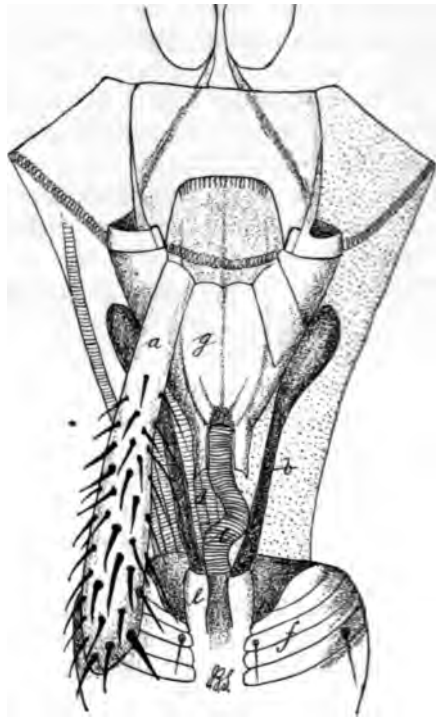

FIG. 2.

are for a short distance almost contiguous then again widely open, showing a transverse septum rising to half the

height of the cylinder, with a central trigonate nick to guide the lancet, and finally again the tube is almost completed just before the tip. This tip has exactly the shape of the opening at the tip of the opercular sheath and fills it completely. It is perhaps questionable whether this organ is used in piercing or is even inserted into the wound. The hypopharynx or lancet is a simple half tube. In *Stomoxys calcitrans* the structure of the canula is different and much more simple, being uniform until just below the extreme tip and there the tube is completed.

The opercular sheath contains considerable muscular and other structure which was not studied. From the base of the hypopharynx a ringed tube leads direct into the fulcrum which is the sucking or pumping organ. From the base of the canula on each side the "great tendons" of Macloskie extend along the side of the fulcrum nearly to the top. These are according to Dimmock "the remnants of the basal chitinous supports of the maxilla." They are securely attached to the canula and I could not find any point of attachment at the other extremities. In separating the parts of the mouth they always remain attached to the canula. In specimens mounted in balsam no muscular structure is observable attached to them. The fulcrum is funnel shaped as shown in the figure, and to the upper margin the very long heavy palpi are attached. In *Stomoxys calcitrans* the fulcrum is quite different in shape, quadrate conic rather than cylindric, the very small palpi attached to the frontal lateral supporting rods rather close to the lower part of the fulcrum and therefore essentially different in location and more like *Musca*.

The palpi in *Haematobia* are quite densely set with stout spinous hair.

Dr. Macloskie is studying *Stomoxys* and *Haematobia*, and he will undoubtedly be able to complete and elaborate this rough outline structure.

In examining the wings I noticed a

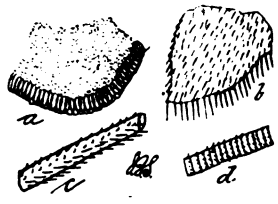

FIG. 3.

curious difference between the main wing and the alar appendix. The former is of the common membranous structure clothed with very fine pubescence, the margins ciliated and not thickened. The appendix shows no pubescence but is minutely and rather densely punctulate. The margin is formed by a spiral, coil-like tracheate structure. The veins also show differences in structure. The main trunks are complete, continuous tubes set with fine, rather short hair. The auxilliary veins which do not reach the base, and some of the transverse veins, are distinctly ringed and segmented, the segments set with transverse rows of minute hair. Whether this indicates the original tracheate nature of these veins I cannot say.

FIG. 4.

The extensile oviduct of the fly is a very pretty object when fully spread out under the microscope. It is seen that at each segment is a broad belt of closely laid scales and that strong chitinous rods support the tube and probably aid in the expulsion of the ovum.

I have examined this organ in a number of diptera and find it different in detail in each species.

The genitalia of the male are quite complicated, and in this species comparatively

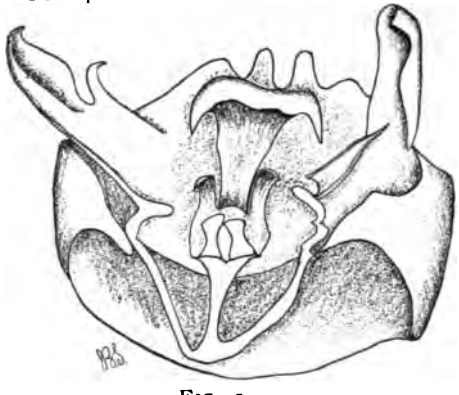

FIG. 5.

larger and more easily studied than in *S. calcitrans* or in *Musca domestica*, both of which differ very decidedly from our species. The figure is from a camera drawing and no attempt has been made to symmetrically arrange the parts. The broad uncus with its spreading and elongated lateral angles at tip is supported at base by two smaller processes with rounded, curved tips. The harpes are membranous rather than chitinous, and are only apparently dissimilar, the hook like process of the left figure being concealed on the right. So the accessory clasper at the base of the right harpe is not shown on the left, though it is also present. A close study of these organs in the diptera will undoubtedly show many interesting structures.

The mouth parts of the larva were also studied and the figured structure was presented. The outward appearance is that of a ringed lip with a central opening behind which rise the fleshy eminences which bear the small palpi. The lips are made up of the usual tubular structure, the margins open and giving the appearance shown at 3 in figure 6. It seems there as if the tubes were made of an endless piece of structure the material being drawn from one to the other. When properly treated the tissue becomes transparent and the chitinous sucking or pumping stomach is brought into view, lying mostly within the first segment. This organ is roughly six-sided, three of the plates distinctly chitinous, the others more membranous and furnished with powerful muscles—in fact muscular bands are attached at all angles of this structure and thus the pasty mixture upon which the larva subsists is drawn into the stomach.

The fly oviposits, in my experience, largely at night, though the observations made under Prof. Riley's direction prove that many are also laid during the day. Flies in captivity always oviposited for me at night only. I never was able to see in the field a single fly on fresh droppings during the day, while eggs were easily found on these one day old. No amount of negative result can counterbalance positive observation, but I still believe that eggs are largely laid at night, in New Jersey at least. Observations made by Mr. Bodee of Freehold are confirmatory of this view. The fly hibernates in the imago state, and in a winter like the one just past, breeds nearly all the time, remaining quiet in stables and wherever it finds shelter only in really cold weather. Dr. Lockwood bred the flies in February from droppings brought in from the fields.

It is a rather curious phase in the history of this fly that up to the beginning of August it seems to increase enormously, fairly swarming about the cattle, — worst perhaps in June and early July, — while they are scarcely annoying after the middle of August and hardly as abundant as *Stomoxys*. It seems also that early in the year they congregate about the base of the horns of cattle much more than they do later in the season.

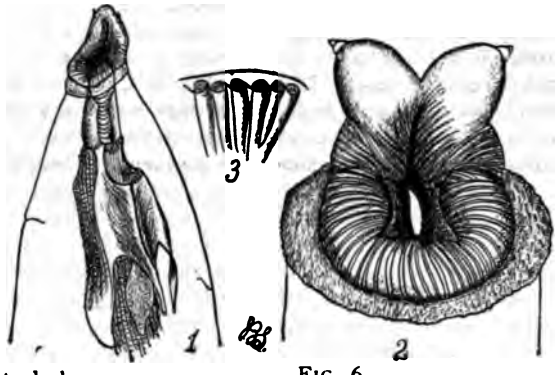

FIG. 6.

Fig. 1. *a*, Tip of opercular sheath; *b*, a single sucker disc; *c*, tip of canula; *d*, tip of hypopharynx: all enlarged.

Fig. 2. *a*, Palpus — The corresponding organ of the opposite side is omitted; *b*, the "great tendons"; *c*, throat; *d*, muscular bands to direct the proboscis; *e*, base of canula; *f*, base of opercular sheath showing ringed structure and tactile hairs; *g*, the fulcrum: enlarged.

Fig. 3. *a*, Alar appendix; *b*, piece of wing; *c*, piece of trunk vein; *d*, piece of transverse or auxilliary vein: enlarged.

Fig. 4. Oviduct of female: enlarged.

Fig. 5. Genitalia of male: enlarged.

Fig. 6. *1*, Head and anterior segment of larva showing structure of pumping stomach; *2*, mouth, further enlarged; *3*, tubes of lip still further enlarged.

NOTES ON THE SOUTHERN DISTRIBUTION OF SOME COMMON BUTTERFLIES

There seems to be a little uncertainty as to the proper Southern range of some of our otherwise well-known butterflies, and so possibly the following notes, though coming from only a limited locality, may help to add a link in the chain of life history of our lepidoptera.

CHRYSOPHANUS HYPOPHLAEAS: In the month of August 1889, I found this fairly abundant in the neighborhood of Caesar's Head, S. C. These agree with New Jersey

examples in my collection. I found them along roadsides bordering fields, and sometimes in the wet sandy roads where mountain streams crossed. In Columbia, S. C., this past autumn, I found *C. hypophlaeas* quite common, frequenting the open meadows and weedy fields, and appearing frequently on the college campus. They presented the same quick nervous flight that I have observed in the species elsewhere and which is characteristic of the Theclas rather than our forms of Lycaena. My first acquaintance with them here was in October, and they continued abundant until late in December. They were on the wing late in February, apparently a fresh brood, and during March were quite plentiful. As yet, however (8 April) there seems to be but the one brood, the unseasonably cold weather in March having doubtless affected them. I am unable to give any information about the number of broods. I have never seen it near Charleston.

NEONYMPHA CANTHUS: This species is given by all authors as northern and western.

While collecting Catocalas in September, 1889, in a thick swamp in Clarendon county, S. C., near the Santee River, I came to a spot where a ray of sunlight, penetrated the thick foliage far overhead; and there, in the glow, were a great number of the Wood Ringlet, *Debis portlandia*, having a game of "Toucher," or "Hide-and-seek" with one another. I stood watching their gambols for some time, until I thought that one of their number seemed smaller and otherwise different from the rest; in a moment he lit close to me, and I saw to my surprise, that it was something entirely different, and at the moment I could not place it. That was enough however, and I started to capture it; but the game was not in my own hands; at the first movement, off he went jerking in and out among the cypress knees and live oak buttresses for some distance, and becoming invisible when he lit. Capture on the wing seemed the only possible means of securing him, and so off I dashed, into tree-trunks, splashing through water and occasionally falling flat in the mud, over a concealed root, but the last time I fell, my net was over my prize, which proved to be *Neonympha canthus;* after considerable beating about, I started another, whose final capture was effected after a repetition of my first chase.

These were the only two seen, though I hunted the same swamp for the next day. An early departure prevented further search. This capture seemed strange, for that especial swamp has been a favorite hunting ground of mine for over eight years, and has been searched thoroughly by me.

These two are much darker, and of a gray rather than a brown tint, when compared with Maine examples in my collection, and also with Mr. Scudder's admirable figure. This is the only instance to my knowledge, of the occurrence of the species anywhere in the southeastern states.

Ellison A. Smyth, Jr., Columbia, S. C.

THE GENUS ARGYNNIS. The reprint (PSYCHE v. 5, p. 308–317) of Mr. H. J. Elwes's observations on the North American Argynnides did not include the table of synonyms, list of localities and other interesting matter. Mr. Elwes will be glad to send a separate of his paper to anyone desiring to study his views more fully than can be done from the reprint in PSYCHE. His address is Preston House, Cirencester, England.

HABIT OF VESPA. In PSYCHE v. 5, p. 54, Mr. J. H. Emerton figures a wasp, apparently *Vespa maculata*, hanging by one leg devouring a fly. When I read his account, I could hardly believe that so singular a position could be usual, and was therefore much interested in observing the same thing here in Colorado last year. On 24 August, near Willow Creek, Custer Co., Col., I found a *Vespa maculata* devouring a fly in exactly the same attitude as figured by Mr. Emerton. It was hanging from the edge of the roof of a house.

T. D. A. Cockerell, West Cliff, Col.

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CONTENTS:

ADVERTISEMENTS 350
THE LIFE-HISTORY OF SIERARCTIA ECHO.—*Alpheus Spring Packard* . . 351-353
TWO SPECIES OF AESCHNA.—*Hermann August Hagen* 353-355
DESCRIPTIONS OF SOME NEW NORTH AMERICAN DOLICHOPODIDAE.—*William M. Wheeler* 355-362
THE FOSSIL INSECT LOCALITIES IN THE ROCKY MOUNTAIN REGION.—*Samuel Hubbard Scudder* 363
ENTOMOLOGICAL NOTES 363-364

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Cambridge, Mass.

PSYCHE.

THE LIFE-HISTORY OF SEIRARCTIA ECHO.

BY ALPHEUS SPRING PACKARD, PROVIDENCE, R. I.

In Entomologica Americana for August, 1889 (vol. 5, p. 153-155), Mrs. Annie Trumbull Slosson gives an interesting account of the occurrence of *Seirarctia echo* Abb. and Sm. in Florida, notes its habits and adds a description of the fully grown caterpillar, prepared by Mr. H. Edwards. She kindly sent me the eggs from Ormond, Fla., on the eve of my departure to Europe for the summer. These Mr. Joseph Bridgham kindly raised for me, and made excellent enlarged colored sketches of the larva in its different stages. As these are evidently faithful studies, and as Mr. Bridgham has drawn under my direction the early stages of other arctians, I think it will be safe to describe them from his drawings, although unfortunately none of the caterpillars were preserved in alcohol. The eggs are laid in Florida on the dwarf palmetto (*Sabal palmetto*) ; my specimens were fed on lettuce.

Stage I.—Length 2½-3 mm.. Head nearly as wide as the thickest part of the body, being but slightly narrower than the prothoracic segment; in tint, dark brown, rather darker than the body; rounded. Body of the same thickness from the 1st thoracic to the 8th abdominal segment. A transversely sublunate dorsal plate or rudimentary "conical shield" on the prothoracic segment bearing on the front edge a slightly curved row of six moderately large piliferous warts; behind which is a tranverse row of smaller ones; the spinulate hairs arising from the larger warts are very long and project over the head. Behind this plate on each side is a single piliferous wart; farther down in front are two adjoining warts, and still farther down is another group of two similar warts.

The warts on the meso -and metathoracic segments are similar in shape, size and position. On each side of each segment is a group of three large warts, two of them coalesced, the third one below the others. On abdominal segments 1—8 there are two rows of small dorsal warts, two to each segment, which are *not present on the thoracic segments*. The arrangement of the subdorsal warts is the reverse of that of the two hinder thoracic segments; of the two sets of warts on each segment, the upper or dorsal is a single large one, and the two coalesced ones below are in the same position as the lower single one of the 2d and 3d thoracic segments. Lower down are three lateral rows of

piliferous warts, there being three warts on each segment; those of the uppermost row (each situated behind a spiracle) are the largest and arranged obliquely; those of the middle row are crescent-shaped; while those of the third row are minute and situated at the base of the legs, or in corresponding places on the apodal segments. It is to be observed that *the arrangement of the warts on the 8th segment is exactly the same as on the seven segments in front of it.* On the 9th segment there are two large subdorsal groups of three coalesced segments, the area either one of them occupies being the same as that covered by one of the double warts on the 2d or 3d thoracic segments. The suranal plate is roughened with crowded warts. The body is pale vandyke brown, the warts darker. The hairs are nearly twice as long as the body is thick, being long and sparse.

Stage II.—Length 4-5 mm. The head is a little smaller than before, but the body is of the same shape; the warts on the prothoracic shield are less pronounced, and the warts on the rest of the body preserve the same arrangement as before, but are decidedly smaller. The body is slightly more reddish in tint.

Stage III.—Length 7 mm. The head is now slightly narrower in proportion to the width of the body than before. There is now a great change in the nature of the piliferous warts, and a marked increase in the number of hairs. The prothoracic shield shows a tendency to divide into halves. The primary piliferous warts have undergone a differentiation so that the surface has become covered with small secondary piliferous warts each bearing a hair one-half shorter than those of the preceding stages, so that the longest ones are about as long as the body is thick; the hairs are thus arranged in thin tufts or verticils. The two compound warts on the 9th abdominal segment are larger than before. The arctian features thus seem to be assumed in the third stage.

Stage IV.—Length 10-11 mm. The head is slightly smaller in proportion than before and now differs much in mode of coloration; there is a median pale stripe from the the vertex to the front; the clypeus being pale, and connecting with a broad lateral pale band.

The prothoracic shield is now completely divided by a median line. The piliferous warts are somewhat smaller than before, but the hairs are of the same length. The position of the dorsal warts on the 2d and 3d thoracic segments have somewhat changed their position besides being smaller. They are arranged in a slightly curved line across the segment. The four dorsal ones on abdominal segments 1-8 are arranged more in a trapezoid than before. The two dorsal warts on the 9th segment are now about half as large as in the preceding stage. The general color of the body is more reddish than before, with a slight chestnut tint.

Stage V.—Length 15-16 mm. (Evidently underfed.) The head is marked as before, but the body is

considerably thicker. The markings of the body have materially changed. The prothoracic shield, in the two last stages split in two longitudinally, is now also split tranversely, so that it is represented by four transversely narrow piliferous warts. On each succeeding segment there is a transverse dorsal broad black-brown band, which encloses a yellowish white narrow stripe, which in the middle and at each end enlarges into a round spot; there are ten such curious whitish stripes on a blackish ground, which only extend part way down the sides of the body toward the spiracles. The piliferous warts are not so pronounced as in the preceding stages, while the body and hairs are of a pale chestnut hue.

Stage VI and last. — Length 23-24 mm. (Evidently underfed, Mr. Edwards's specimens measuring 52 mm.). In the final stage the head is pale chestnut, with no black portion. The top of the body is now black, and each segment except the first behind the head bears two transverse white stripes, one in front and the other behind a transverse chestnut-red band, enclosing the piliferous warts, which are much more prominent than in the 5th stage. Of the two yellowish white transverse stripes, the one on the front of the segment is divided into a central dot with a separate slash on each side; the hinder band consists of three portions, a central dot, from which a stripe passes each side, and instead of ending in a dot, makes a loop or hook. Our drawings made by Mr. Bridgham agree well with Mr. Edwards's description.

It thus appears that the markings of the two last stages of this larva are very different from those of any genus whose larval history is known to us; Mr. Edwards has pointed out its relations to the larva of Arachnis and Ecpantheria, with which we are not familiar.

TWO SPECIES OF AESCHNA.

BY HERMANN AUGUST HAGEN, CAMBRIDGE, MASS.

I. AESCHNA SITCHENSIS.

Aeschna sitchensis Hagen, Syn. Neur. N. A. 119, 1.

Blackish-brown, spotted with blue; head yellow in front, anteriorly with a narrow transverse black line; superiorly a large black spot in the shape of a T, nearly or entirely connected each side with a black band before the eyes, forming two yellow spots surrounded with black on the superior part of the front; rhinarium and border of the labrum black; eyes largely connected; occiput yellow, hind border elevated, black on each side; thorax fuscous, dorsum with two median elongated points; sides

darker with two maculose narrow, very angular stripes, whitish blue; abdomen long, slender, equal, very much arcuated behind the inflated base in both sexes; brown spotted with blue; segments 3-10 with two large, apical blue spots, 3-7 with two basal blue spots; second segment with two blue lines on each side; appendages (♂) black, moderate, a little incurved, foliaceous, the base narrow, finely denticulated on the inner margin; carinated within, before the apex the carina is inflated and finely spinulose; the rounded apex has a very short, acute, incurved spine; inferior appendage one-half shorter, elongately triangular, obtuse; appendages (♀) foliaceous, broad (only the basal part is known). Genital parts in the second segment (♂) similar to those of *A. septentrionalis*, but the outer spine of the anterior piece is longer than the hamulus, slender, the tip sharp and curved downwards; hamuli foliaceous, flat, cut straight on the tip; feet brown, black beneath; wings hyaline, costa yellow; pterostigma elongated, fuscous; membranule brackish gray; the subnodal sector sometimes not bifurcated; 15-18 antecubitals, 8-11 postcubitals. Length 55-58 mm.; alar expanse 78-83 mm.; pterostigma 4 mm.

HAB. Sitka, Alaska; Saskatchewan, Brit. Amer.

I have seen three males and two females. In my Synopsis an imperfect female was described; this species is very similar to *A. septentrionalis* but differs in the genital parts of the male, the longer connections of the eyes, the color of the front, and the slender abdomen. *Aeschna minor* Rambur. quoted in the Synopsis, p. 20, as very similar, belongs to *A. janata* Say.

II. AESCHNA SEPTENTRIONALIS.

Aeschna septentrionalis Burm. Handb., 1839, v. 2, 839, 11.—Hagen Syn. Neur. N. A., 120, 2.

Blackish-brown, spotted with blue; head yellow in front; anteriorly a narrow transverse line, superiorly a large spot in the shape of a T; the rhinarium and margin of the labrum black; eyes shortly connected; occiput large, yellowish, the hind border elevated, black on each side; thorax fuscous, dorsum with two median elongated points; sides darker with two narrow, maculose and angulated stripes, whitish-yellow; feet black, above rufous; abdomen long, stoutish, narrowed behind the inflated base (♂), black, spotted with blue; last segment blue, with a broad black median band, scarcely reaching the tip; an elevated basal tooth above (♂); appendages brownish black, moderate, a little incurved, foliaceous, the base narrow, a basal obtuse tubercle beneath; carinated inwardly, apex obtuse inflated in front; inferior appendage one half shorter, elongately triangular, obtuse; genital parts in the second segment (♂) with the anterior piece elevated; strongly depressed in the middle, with a conical, straight, stout spine, as long as the hamulus on each side; hamuli foliaceous, cut obliquely on the tip with the outer angle rounded, the interior part is bent up suddenly, large, triangularly shaped on the base; penis with a hook on

the antepenultimate segment; appendages (♀) short (3 mm.) foliaceous, broad, obtuse, wings hyaline, costa yellow; pterostigma elongated, fuscous; membranule blackish gray; the subnodal sector sometimes not bifurcated; 13-16 and 18 antecubitals; 10-12 postcubitals; 4-5 areoles beneath the pterostigma. Length 51-60 mm.; alar expanse 74-86 mm.; pterostigma 4 mm.

HAB. Labrador; Fort Resolution and Saskatchewan, Brit. Amer.; one ♂ White Mountains, N. H.

This species is very much like *A. borealis* from Europe; I am not able to separate the males, except that the T spot on the front has a larger and more rounded head in *A. septentrionalis;* the appendages of the female are more widely separated at the base, less broad and somewhat incurved in the European species. I consider the two species as local varieties, but owing to the obvious difference in the appendages of the females it seems more prudent to keep them separate for the present. I have compared 15 specimens of *A. septentrionalis* and 9 specimens of *A. borealis* from Lapland, Sweden, Silesia and Switzerland. Both are arctic species. Many years ago I saw a specimen from the Wilui River, Siberia, but this specimen is not at hand and as at that time I believed *A. sitchensis* to be the same species I am unable now to say if the Siberian specimen belongs to *A. borealis*.

DESCRIPTIONS OF SOME NEW NORTH AMERICAN DOLICHOPODIDAE.

BY WILLIAM M. WHEELER, MILWAUKEE, WIS.

(*Continued from p. 343.*)

GYMNOPTERNUS POENITENS, n. sp. ♂

Length 2.75 mm.; length of wing 2.75 mm.

Dark metallic green. Face moderately broad, covered with hoary dust. Antennae black throughout, third joint large and of the usual shape, somewhat pointed and covered with conspicuous whitish pubescence; pubescence of the arista, which is inserted in the middle of the dorsal contour of the third joint, appressed and perceptible only with difficulty. Front rather dull metallic green; cilia of the inferior orbit white. Thoracic dorsum shining blackish green, posteriorly with a brilliant golden reflection, apparently without any traces of dust. Scutellum blackish green with a golden reflection, bearing a few black hairs besides the usual setae. Pleurae anteriorly metallic greenish black, posteriorly black, overlaid with hoary dust. The yellow tegulae have black cilia. Abdomen blackish green, lacking the golden reflection of the thorax and scutellum; venter black, dusted with white; hypo-

pygium black; lamellae large, elongate oval, brownish yellow, posterior edges black, irregularly crenulated and fringed with weak black bristles; the numerous smaller and more concealed appendages of the hypopygium yellow. Coxae and legs black throughout; femora with a faint metallic green reflection. Fore legs smooth, tarsi equaling the tibiae in length; median femur with a preapical bristle, median tibia with two setae on its posterior face, separated by a distance equal to ½ the length of the tibia; hind femur with a preapical bristle, hind tibia with four or five spines along its posterior face. Halteres pale dull yellow. Wings smoky gray, becoming almost black along the costal margin; veins black, the third and fourth longitudinal veins gently converging and, for a *Gymnopternus*, very closly approximated at their tips. Anal angle very obtuse, giving the wing a lanceolate outline.

HABITAT: Milwaukee Co., Wis.

Gymnopternus poenitens is to be admitted to the group comprising Loew's *G. scotias*, *G. barbatulus*, and *G. tristis*, all of which differ from the other described North American species of the genus in having the prevailing color of the feet black. *G. poenitens* differs from *G. scotias* in having the cilia of the inferior orbit white, the feet entirely black, the hypopygial lamellae large and in great part yellow; from *G. barbatulus* and *G. tristis*, *G. poenitens* differs in the more hairy third antennal joint and its completely black legs. Both of Loew's species also have the cilia of the inferior orbit black. The course of the third and fourth longitudinal veins is very different in *G. poenitens* from what it is *G. tristis*, in which species, according to Loew, there is only a slight convergency, though he mentions in a note a male with a "considerably stronger convergency of the third and fourth longitudinal veins." He considers this specimen to be merely a striking variety of *G. tristis*.

CHRYSOTUS WISCONSINENSIS, n. sp. ♂.♀.

Length 2.5–2.75 mm.; length of wing 2.–2.25 mm.

Splendid metallic green. Antennae entirely black; third joint small, rounded, rather hairy; eyes completely meeting on the face in the male; in the female the face broad, covered with silvery white dust, and crossed by a marked tranverse ridge a little above the oral margin. Palpi black, small and somewhat concealed in the male; considerably larger and covered with silvery white dust in the female. Front broad in both sexes, triangular, widening towards the occiput, metallic green, inclining to violet, somewhat dimmed by a layer of fine dust; cilia of the superior orbit black, those of the inferior orbit glistening white. Thoracic dorsum and scutellum bright golden green, overlaid with a thin layer of yellowish white dust, which is thickest on the humeri: pleurae metallic green, rather thickly covered with white dust, cilia of the tegulae white. Abdomen bright golden green, rather thickly covered with black hairs; terminal segments more blackish; hypopygium of the male quite large, barely concealed, appendages glistening, black. Legs quite hairy; fore coxae yellow, their extreme bases metallic green in front; their tips with a tuft of black hairs. Anterior tarsi blackened from the tip of the second joint; hind legs somewhat robust, tarsi equaling the tibiae in length, black and quite hairy, only the base of the metatarsal

joint yellow; apical third of the tibia blackened. The mature male has a rather broad metallic black band around the apex of the hind femur, leaving only the extreme tip yellow. In the female and immature male this band is represented by a more or less distinct black or fuscous spot. In the male there are several (about six) robust spines on the posterior face of the hind tibia and three less conspicuous and obliquely inserted setae at the tip of each of the four posterior femora. Halteres bright yellow. Wings grayish hyaline with black veins; the posterior cross-vein is some distance in front of the centre of the wing.

HABITAT; Milwaukee Co., Wis.

The coloring as described above is constant in five males and three females in my collection. The species is allied to *Chrysotus pallipes*, Loew. It differs in having the eyes completely contiguous in the male and not separated by a linear white face, and in having the hind legs very differently colored. In Loew's species the hind legs are yellow; "even the tarsi are only slightly dusky towards the tip." Loew's specimens could hardly have been immature individuals of *C. wisconsinensis* as I have three immature specimens which differ from the mature ones only in having the shining black subapical band of the hind femora represented by a fainter spot.

CHRYSOTUS PRATINCOLA, n. sp. ♂

Length 2.25 mm.; length of wing 2 mm.

Palpi brown; antennae black, third joint small, rounded, with apical arista. Face broad for a male *Chrysotus*, opaque black, as is also the front in my specimen. Cilia of the superior orbit black, those of the inferior orbit sparse, whitish. Thoracic dorsum, scutellum and abdomen metallic green, rendered almost opaque by a thick layer of brown dust: pleurae opaque, black. Cilia of the tegulae pale yellowish. The sparse hairs covering the abdomen dirty white. Hypopygium black, concealed; venter of a paler and more bluish metallic green than the terga. Coxae opaque black, tipped with yellow and each provided with a tuft of glistening white hairs on the anterior face; these hairs are longest on the fore coxae. Legs not very hairy; femora black with metallic green lustre, especially on the hind pair; their apices and extreme bases yellow; tibiae yellow covered with short weak black hairs; tarsi yellow, blackened on all the feet from the tip of the first joint; hind tarsi scarcely as long as the hind tibiae. Halteres honey yellow. Wings hyaline, with very faint grayish tinge; veins black; the black costa is moderately incrassated from its juncture with the first longitudinal vein to the tip of the wing; towards which it gradually diminishes in thickness; posterior cross-vein in front of the middle of the wing.

HABITAT: Saline Co., Nebraska.

The moderately thickened costa, the broad face and the coloring of the femora place this species near Loew's *Chrysotus subcostatus*. From this species *C. pratincola* may be distinguished by its very thick covering of brown dust and the pale hairs covering the abdomen. Perhaps a greater number of specimens than either Loew or I have had the opportunity to examine, may show the two species to be identical.

CHRYSOTUS CHORICUS, n. sp. ♂

Length 2. mm; lengh of wing 1.75 mm.

Bright metallic green. Palpi pale, fus-

cescent towards their bases. Face very narrow, the eyes almost meeting, covered with whitish dust. Antennae deep velvety black. first joint somewhat slender, third joint broad and hairy, ending anteriorly in a short and blunt point, above which is inserted the arista. Front metallic green, its edges at first parallel, then diverging posteriorly; cilia of the inferior orbit pale. Thoracic dorsum and scutellum bright metallic green, with scarcely any dust; pleurae greenish black, dusted with white. Tegulae with glistening white cilia. Abdomen short, cylindrical, and like the thoracic dorsum, bright metallic green, rather thickly covered with stiff black hairs; its terminal segments more blackish; appendages of the hypopygium pale, hairy. Coxae black, with yellow tips, the anterior pairs with tufts of rather long white hairs. Legs very hairy; femora shining metallic green, tips and extreme bases pale yellow; fore tibiae pale yellow; median tibiae growing blackish towards their apices. Anterior tarsi black excepting the base of the metatarsal joint, which is yellow; pulvilli not perceptibly enlarged. Hind legs more robust than the anterior, tibiae and tarsi shining blue-black; each femur with a row of black hairs, running from the base to the apex on the outer edge and increasing in length distally; hind tibiae and tarsi thickly clothed with rigid black hairs; the former with five spines on the posterior face, the latter robust, not perceptibly tapering till the fourth joint. Peduncles of halteres brown, capitula honey yellow; their tips sometimes blackened, more often only slightly infuscated. Wings grayish hyaline with black veins.

HABITAT: Milwaukee Co., Wis.

This species is related to *C. obliquus*, Loew, and somewhat more closely to *C. affinis* of the same author. It differs from both in having the cilia of the tegulae white, from *C. obliquus*, also in the hirsuteness of the hind tibia and tarsus.

CHRYSOTUS PICTICORNIS, Loew. ♂ ♀

Length 1.5–2.25 mm.; length of wing 1.75–2. mm.

Palpi pale, somewhat blackened at their bases, and clothed with a few scattered, long blackish hairs; eyes contiguous on the face in the male; face of the female moderately broad, dusted with white and presenting near the oral margin a slight swelling, on each side of which, abutting on the orbit lies a small rectangular black spot. Antennae in both sexes with the basal joint pale yellow, the two apical joints deep black, clothed with rather abundant pale pubescence; arista inserted apically. Front and occiput metallic green, dulled by a layer of yellowish dust; cilia of the superior orbit black, those of the inferior orbit glistening white, very conspicuous in some specimens. Thoracic dorsum and scutellum metallic green, considerably dimmed by a layer of yellow dust, thickest on the anterior portion and on the humeri; pleurae metallic green, inclining to blackish, dusted with white. Tegular cilia black. Abdomen coppery green, not very vivid, with the incisures narrowly blackish, the terga covered with short pale hairs which appear black in some lights and are somewhat more appressed in the female than in the male; hypopygium inconspicuous, its longer appendages pale yellow. Legs pale yellow, moderately hairy; fore coxae blackened only at their extreme bases; posterior coxae with their basal halves blackened. Tarsi blackened only towards their tips. Hind femora with prominent preapical bristle. Halteres honey yellow. Wings grayish hyaline; posterior cross vein a considerable distance in front of the middle of the wing.

HABITAT: Milwaukee Co., Wis.

Loew's description of this insect is so brief, being taken from a single imperfectly preserved specimen, that I have seen fit to describe it again. The small size of the species, the pale color of the first antennal joint, which Loew describes as red, but which is really pale yellow in well-preserved specimens, and the locality (Loew's specimen was from Illinois) are proof sufficient that my specimens are true *D. picticornis*. The species is common in damp woods near Milwaukee.

DIAPHORUS SATRAPA, n. sp. ♂

Length 2 mm.; length of wing 1.75 mm.

Palpi rich brown; face narrow, covered with thick silvery white dust; antennae yellowish brown, hairy; third joint pointed (with dorsally inserted arista?) Front and occiput bronze black, with violet reflection, shifting to cupreous posteriorly, the surface covered with very fine appressed white hairs; inferior orbit thickly powdered with white dust; cilia glistening white. Thoracic dorsum vivid blackish bronze, with a shining violet patch on the disc, bordered on each side by a broad and obscurely defined cupreous band. Scutellum flattened, vivid bronze green. Pleurae bronze green, covered with silvery dust; there is a patch of thick white dust on the humerus, very conspicuous when the insect is viewed from above, and extending down to the insertion of the fore coxa. Tegulae pale yellow, with white cilia. Abdomen slender, covered with rather stout black hairs; basal segment bronze green; second and third segments pale yellow, the latter bronzed on its posterior border; remaining segments vivid blackish bronze; hypopygium brownish, scarcely protruding, covered with pale yellow hairs. Coxae and feet pale yellow, somewhat slender and not very hairy; fore coxae bearing on their anterior faces several long yellowish brown hairs; median coxae similarly adorned, one of the hairs, however, is very long and blackish; median femur with two stout blackish spines near the apex. Fore and median tarsi blackened towards their tips, the former very slightly, the latter more conpicuously. Hind legs only moderately hirsute; apical half of each femur brown on the upper face; tibiae brownish and the tarsi, excepting the extreme base of the first joint, deep brown. Halteres honey yellow. Wings more brownish than grayish hyaline, owing to the brown veins and the rather thick covering of microscopic brown hairs; posterior cross-vein very near the middle of the wing; third and fourth longitudinal veins gently curved but still parallel; anal angle not prominent as in several other species of the genus.

HABITAT: Saline Co., Nebraska.

My single specimen of this beautiful *Diaphorus* has lost the tips of the antennae and of several of the tarsi, so that I can assert nothing in regard to the insertion of the arista or the development of the pulvilli. The other form-characters, however, agree so well with those of other species of *Diaphorus* that I do not hesitate to assign it to this genus. The color of the abdomen is very unlike that of any described North American *Diaphorus*, but approaches the European *D. tripilus*, Loew, *D. hoffmannseggii*, Meigen and *D. oculatus*, Meigen, being closely allied to the latter. These European species form a subgeneric group characterized by the more or less extended yellow band encircling the base of the abdomen. Heretofore no members of

this group have been described from America; in all of Loew's species the abdomen is metallic green (or in *D. opacus* black) throughout. Loew recognized the fact that the American *diaphori* are especially heterogeneous, but with his usual fine judgment declined to resolve the genus into several. Such an attempt even at the present time, would be unwise, as I am convinced that there are still many North American species awaiting description.

DIAPHORUS PALPIGER, n. sp. ♂

Length 2.75 mm.; length of wing 2.5 mm.

Palpi very prominent, as long as the face, from the insertion of the antennae to the oral margin; glistening white, golden yellow at their bases, with a few long silvery hairs on their edges. Face broad, covered with yellow dust and presenting a somewhat shallow, v-shaped depression near the oral margin. Antennae black, apical joint more piceous, hairy, twice as broad as long, reniform with subapical arista. Front and occiput broad, without any tendency to contiguity in the eyes, covered with the same glistening yellowish dust as the face; cilia of the superior orbit short and black, those of the inferior orbit very long and silvery white, forming a conspicuous, though not very dense beard when the head is seen in profile. Thorax and scutellum golden green, their brilliancy much subdued by a thick layer of yellow dust most abundant on the anterior half of the thoracic dorsum and on the lateral corners of the scutellum; pleurae greenish black, dusted with white, the yellow dust of the thoracic dorsum extending over the humeri on to the anterior pleurae a short distance. Tegulae pale yellow with yellow cilia. Abdomen metallic green, not vivid and less golden than the thorax and scutellum; intersegmental incisures narrowly black as are also the short robust hairs covering the segments; hypopygial appendages pale yellow. Coxae concolorous with the pleurae, dusted with white. Femora slightly enlarged, black on their inner and lower faces, which are dusted with white but metallic green on their upper faces; knees rather broadly pale yellow; tibiae and tarsi black, inclining to piceous at the joints; pulvilli dilated on all the feet. An even row of bristles runs the full length of the under surface of the fore femur, and a long and stout bristle projects from the anterior face of the median trochanter. Posterior legs hirsute; besides the usual short bristles clothing the tibiae, there is a row of prominent bristles on their anterior and posterior faces. Halteres honey yellow. Wings grayish hyaline, third and fourth longitudinal veins gently converging near the apex of the wing, but becoming parallel just before their termination; anal angle not very prominent; sixth longitudinal vein distinct.

HABITAT: Milwaukee Co. Wis.

This species is so different from all the species described by Loew, that no difficulty will be experienced in recognizing it. Its dark colored legs and pale tegular cilia place it in the group comprising Loew's *D. leucostomus* and *D. interruptus*. The lack of a conspicuous point to the third antennal joint immediately distinguishes it from the former, while the uninterrupted fourth longitudinal vein as readily distinguishes it from the latter.

DIAPHORUS RAUTERBERGI, n. sp. ♂.

Length 3 mm.; length of wing 2.5 mm. Palpi small, fuscous with paler edges. Face somewhat narrowed below, evenly rounded without any indication of a transverse swell-

ing, covered with coarse yellowish dust. Antennae black, basal joint short, third joint large, hairy, much shortened and expanded so as to appear kidney-shaped; arista apparently with apical insertion. Front subquadrate, together with the occiput covered with coarse yellowish dust; cilia of the superior orbit short and black; those of the inferior orbit long and conspicuous, of a yellowish tint. Thoracic dorsum, scutellum and abdomen metallic green, covered with coarse yellow dust, which is very thick on the thorax and scutellum, but much less so on the abdomen. Pleurae black, dusted with white, the anterior portions more metallic green. Tegular cilia pale yellow, appearing brown in some lights. Abdomen covered with short black hairs, which are almost lacking on the terminal segment where they are prominent in other species; hypopygium black, the tips of the concealed appendages pale yellow. Coxae black, dusted with white. Femora vivid metallic green, broadly tipped with yellow; tibiae and tarsi yellow, the latter with enlarged pulvilli on all the feet; anterior tarsi blackened from the tip of the first joint; hind tarsi brown from the tip of the first joint, only the last joint more blackish. The black hairs and spines on the legs of about the usual length. Halteres honey yellow. Wings grayish hyaline, with brown veins, which become yellow towards their origin; third and fourth longitudinal veins nearly parallel on the apical third of the wing; posterior cross-vein at about the middle of the wing; anal angle not very prominent.

HABITAT: Saline Co., Nebraska.

The peculiar configuration of the third antennal joint readily distinguishes this species from *D. leucostomus*, to which it is in most other respects closely affiliated.

PORPHYROPS LONGIPES, LOEW. ♂.

Length 3.5 mm; length of wing 3 mm.

Palpi black, with a few rather long black hairs. Face narrow, silvery white; antennae black, basal joint smooth and rather slender; third joint flattened, lanceolate, a little more than twice as long as broad at the base, covered with short and even pubescence, apex somewhat rounded; arista straight, distinctly longer than the whole antenna, with appressed scarsely perceptible pubescence. Front and occciput metallic green, slightly dimmed by a layer of whitish dust; cilia of the superior orbit black, those of the inferior orbit silvery white, abundant and increasing in length towards the oral orifice. Thoracic dorsum and scutellum dark metallic green, shining sometimes with a slight cupreous reflection; the former with traces of white dust lines on its anterior part; pleurae greenish black, overlaid with whitish dust. Tegulae pale yellow with silvery white cilia. Abdomen concolorous with the thoracic dorsum, terminal segments more violaceous; the hairs with which it is rather abundantly covered are black, except on the lateral surfaces of the basal segments where they are long, tufted and silvery white; hypopygium shining black, the external appendages long and filiform, sometimes coiled up in dry specimens, pale yellow, strongly infuscated at their edges and clothed with conspicuous black and white hairs; claspers and internal appendages blackish. Coxae blackish green, tipped with pale yellow, each bearing on its anterior face a tuft of silvery white hairs, which are longest and most abundant on the fore pair. Legs hairy; the fore and medium pairs pale yellow, the former with the femora blackish green, excepting their bases and apices; tarsi blackened from the tip of the first joint; metatarsal joint of the fore feet hardly as long as the remaining tarsal joints taken together; there are several long white hairs on the posterior faces of the fore femora; median femora somewhat longer and more slender than the fore femora; hind legs elongated, femora, tibiae and basal tarsal joints incrassated, deep black with the exception of the basal halves of the femora,

which are pale yellow; the hind tarsi though incrassated at the base taper evenly to the last joint. Halteres honey yellow. Wings somewhat lanceolate at their bases, gray, with blackish veins; the third and fourth longitudinal veins at first converge gently, but on approaching the tip of the wing become parallel, the fourth terminating a very short distance in front of the tip.

HABITAT: Milwaukee Co., Wis.

The three males in my collection agree with the above description, which will be found to differ somewhat from Loew's account (Monograph, p. 340, also Centuria 5. 92). The less pigmented hind legs in Loew's specimen, taken in the White Mountains, may have been due to immaturity. I believe that my specimens represent the normal adult male, though it is, of course, possible that they may belong to a western variety with highly pigmented hind legs. Be this as it may, the differences seem hardly of specific value.

SYNARTHRUS CINEREIVENTRIS, LOEW. ♂.

To Loew the male of this species was unknown. It differs from the female as described by that dipterologist, only in the structure of the antennae and the spinulation of the legs, the coloring of my specimen answering perfectly to the color-description of the female. The first antennal joint is rather slender, especially at its base, the second overlaps the inner side of the third by a large rounded flap as in the female; the third joint is long and tapers slowly to an acute point in such a manner as to have the contour of its dorsal side remain straight or slightly concave, while the contour of its ventral edge is convex; the pubescence covering the joint is shorter and less conspicuous than in *S. barbatus*, Loew; the arista which is a little over half as long as the antenna, is rather delicate and clothed with scarcely perceptible pubescence. The spinulation of the legs in the female is not described by Loew, probably because it presented nothing worthy of remark. The male has a delicate and rather long spine projecting from the upper surface of the tip of the median femur, while there are six or seven short, stiff and evenly graduated spines before the middle of its under surface; the inner face of the median tibia has three widely separated black spines; the posterior face of each of the hind tibiae is armed with about eight equidistant black spines, besides the regular rows of shorter and smaller spines; the two spurs at the apex are powerfully developed, of equal length, and, in my specimen, directed at right angles to the long axis of the tibia; hind metatarsal joint with several prominent spines on its under surface; on the inner face of its proximal end a peculiar sickle-shaped spine, bent back in the opposite direction to all the other spines, so that its curved and pointed end comes to lie near the tip of the tibia. This peculiar spine is inserted near the middle of the metatarsal joint, to the surface of which it is applied for some little distance. The abdomen is small, with small, black, and in my specimen, much concealed hypopygium. Length 2.5 mm.; length of wing 2.5 mm.

HABITAT: Milwaukee Co., Wis.

(*To be concluded.*)

THE FOSSIL INSECT LOCALITIES IN THE ROCKY MOUNTAIN REGION.— No one collecting fossil insects in the Rocky Mountain region could fail of noting how close was the general resemblance of the rocks at all places where they have been found, excepting at Florissant, where the fine, tough, homogeneous shales found elsewhere give place to friable masses of ash interlarded with thin seams of hardened mud. A comparison of the insect remains shows a similar difference. The hymenoptera which abound at Florissant almost disappear in the other localities, while the coleoptera, which hold a third place at Florissant, form the larger proportion of the mass in the other deposits. To test the opinion formed by the cursory examination of specimens in the field, I have counted the specimens obtained in each of the different localities visited during a single summer, and find the opinion amply confirmed. The localities visited besides Florissant, Colorado, were Roan Mountains in western Colorado, the lower White River, Colorado, and Green River, Wyoming.

The first set of columns in the accompanying table shows the total number of specimens (regardless of species) obtained during the season's work, separated by orders, (1) in all localities; (2) at Florissant alone; and (3) in the other localities, excluding Florissant; and the second set of columns the same figures reduced to percentages. Nothing could well be more striking than the contrasts in the hymenoptera and coleoptera.

Orders.	Number of specimens.			Percentages.		
	All localities.	Florissant.	Other localities.	All localities	Florissant.	Other localities.
Hymenoptera . .	277	243	34	15.2	34.5	3.0
Diptera	432	184	248	23.7	26.1	22.2
Coleoptera	806	104	702	44.3	14.8	63.0
Hemiptera. . . .	185	86	99	10.0	12.2	8.9
Orthoptera. . . .	19	2	17	1.0	0.3	1.5
Neuroptera . . .	90	75	15	5.0	10.6	1.3
Arachnida	11	11	0	0.6	1.5	0.0
Totals	1820	705	1115	99.8	100.0	99.9

S. H. Scudder.

Entomological Notes.

ENTOMOLOGICAL CLUB, A. A. A. S.—The meeting of the club will be held at Indianapolis, Ind., on Wednesday the 20th of August at 9 A.M. Prof. A. J. Cook of the Michigan Agricultural College is the president.

The venerable naturalist, Prof. Felipe Poey of Havana, well known to entomologists for his valuable papers on Cuban insects, completed his ninety-first year on the 26th of last May. He still occupies himself with natural history studies, and particularly ichthyology.

The Butterflies of the Eastern United States and Canada, issued last year by the author, Samuel H. Scudder, will hereafter be published by Messrs. Houghton, Mifflin & Co. of Boston, the publishers of Edwards's Butterflies of North America.

The Rev. Seymour St. John's little book just published in England, called "Larva collecting and breeding" would better have been given simply its second title, "a handbook to the larvae of the British Macrolepidoptera and their food plants," for there is nothing in it about collecting or breeding. It is simply a list of species and their accredited food plants and the same reversed. To an American the lists seem full. The best equipped caterpillars are, for butterflies *Euchloe cardamines* which has 10 food plants, and for the moths *Acronycta alni* with 15. Some of the plants are fed upon by a very large number of different caterpillars. Thus a list is given of 104 species feeding on *Quercus robur*, *Betula alba* has 84, *Salix caprea* 74, *Crataegus oxyacantha* 60, *Polygonum aviculare* 48, and so on.

The Instituto de segunda enseñanza of Havana has just acquired the valuable entomological collections of Dr. Juan Gundlach who is still untiringly at work, in his eightieth year, on the Cuban fauna. Of his Ento-

mologia cubana Vol. 1 containing the lepidoptera was published between 1881 and 1886. Vol. 2 containing the hymenoptera, neuroptera and orthoptera is now passing through the press at the slow rate of a signature of eight pages a month and will not be finished before 1891. The hymenoptera and neuroptera are already printed. Vol. 3 will contain the remaining orders, "if" writes Dr. Gundlach, "my life dure some years more;"—which all will trust may be the case; indeed when his collections have been transferred he proposes another trip to the mountains of Guantánamo in Eastern Cuba, where he has already secured so many fine collections.

INSECTS DESTRUCTIVE TO WATER PIPES.—And now the coleopterous family *Parnidae* comes under economic suspicion. Pine-staves of the water pipes of the Ottawa (Can.) water system which have been in use fifteen years are found by Mr. Fletcher, Government entomologist, to have lost in this time one fourth of their thickness and in places, and especially at the joints, to have been bored through and through. Mr. Fletcher regards the destruction as due in the first instance to the decaying of a very thin layer of the surface of the wood through the chemical action of the river water; and then to the removal of the decayed surface by aquatic insects so as constantly to expose a new surface to the same action. Beetles belonging to the allied genera *Dryops* and *Macronychus* were found on the injured wood, and in the decayed layer were numerous tracks made by larvae provisionally referred to these same genera; none have yet been bred. Mr. Fletcher thinks their presence in such numbers may possible be due to the unusual quantity of decaying bark lying in a bay of the Ottawa River, near the inlet of the pipe, where for twenty years logs have been sorted for the lumber mills which gives Ottawa its commercial importance. It is now proposed to take the water from a point higher up the river and to use steel pipes.

HABIT OF A DRAGON-FLY.—In the Journal of the Bombay natural history society (v. 4, no. 3), Mr. E. Giles records a curious fact which ought to have some interest for entomologists. In June 1888 he was standing one morning in the porch of his house, when his attention was attracted by a large dragon-fly of a metallic blue color, about 2½ inches long, and with an extremely neat figure, who was cruising backwards and forwards in the porch in an earnest manner that seemed to show that he had some special object in view. Suddenly he alighted at the entrance of a small hole in the gravel, and began to dig vigorously, sending the dust in small showers behind him. "I watched him," says Mr. Giles, "with great attention, and, after the lapse of about half a minute, when the dragon-fly was head and shoulders down the hole, a large and very fat cricket emerged like a bolted rabbit, and sprang several feet into the air. Then ensued a brisk contest of bounds and darts, the cricket springing from side to side and up and down, and the dragon fly darting at him the moment he alighted. It was long odds on the dragon-fly, for the cricket was too fat to last, and his springs became slower and lower, till at last his enemy succeeded in pinning him by the neck. The dragon-fly appeared to bite the cricket, who, after a struggle or two, turned over on his back and lay motionless, either dead or temporarily senseless. The dragon-fly then, without any hesitation, seized him by the hind legs, dragged him rapidly to the hole out of which he had dug him, entered himself, and pulled the cricket in after him, and then, emerging, scratched some sand over the hole and flew away. Time for the whole transaction, say, three minutes." *Nature*, 5 June 1890, v. 42, no. 1075, p. 135.

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CONTENTS:

ADVERTISEMENTS 366
DESCRIPTIONS OF SOME NORTH AMERICAN CORDULINA.—*Hermann August Hagen* 367-373
DESCRIPTIONS OF SOME NEW NORTH AMERICAN DOLICHOPODIDAE.—*William M. Wheeler* 373-379
ENTOMOLOGICAL NOTES 379-380

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Gerstaecker, A. Gliederthiere Insekten, Arachniden, Myriopoden und Isopoden. In Baron Carl Claus von der Decken's Reisen in Ost-Afrika. Leipzig und Heidelberg, 1873. 542 p., 18 colored plates 7.00

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PSYCHE.

DESCRIPTIONS OF SOME NORTH AMERICAN CORDULINA.

BY HERMANN AUGUST HAGEN, CAMBRIDGE, MASS.

[*With Plate 1.*]

1. EPITHECA YAMASKANENSIS.

Aeschna yamaskanensis Provancher Natur. Canad. 1875, v. 7, 238; 248.

Epitheca yamaskanensis Prov. ibid. 1877, v. 9, 86. — Selys, 2d Add. syn. Cordul., 1878, 13, 20, 12.

Male. Olive brown; front and vertex brown, blackish pilose, strongly punctated; front excavated above; labrum yellow, labium pale; antennae blackish; vertex convex above, narrowed to tip, which is half as broad at the base, nearly straight, a little impressed; occupit yellow, brown on tip, whitish pilose behind; yellow behind the eyes, two transversal brownish marks in the middle. Thorax olive brown, densely brownish pilose; dorsum dark brown, paler olive at the humeral suture and below the blackish brown sinus; carina obscure yellowish; sides olive brown; a yellow spot around the stigma; below pale brown. Abdomen long, slender, inflated at the base, contracted on third segment, gradually broader to tip; third segment paler at base; segments 4–9 with a long yellowish spot on each side; transverse sutures black; articulation membrane yellowish; earlets moderate, dark brown, shining, round, pointed behind; last segment short, pale brown; a small dorsal carina not reaching the apical margin, which is prolonged into a triangular lobe between the superior appendages; base of the last segment notched; the articulation membrane enlarged. Superior appendages three times as long as the last segment, black, pilose, approximated, basal half cylindrical, about straight, somewhat contracted just after the base, apical half suddenly enlarged externally, a little divergent, the external border rounded, tapering to a short acute tip, recurved a little inwards and upwards; viewed from the sides, the basal half is cylindrical, a little incurvate, the apical half suddenly increased, tip recurved, acute; an obsolete external ridge not reaching the tip begins where the appendages enlarge and here on the underside is also a small notch. Inferior appendage a little shorter, light brown, triangular, large at base, very much narrowed and recurved on the apical half, ending in a blunt tip, somewhat thicker above. Genital parts on the second segment comparatively small; ventral lobe black, leaf shaped, margin thickened

externally; hook pale yellowish, long, flat, larger at base, tapering to tip which is black, recurved, sharp; penis black, first joint with a short apical spine behind, second joint stout, short, with two erected spines on the tip; last joint cylindrical, pale; elevated spoon black, small, flat, incurved. Legs brown at base, femur blackish below, tibia black, the two margins above yellow; tarsi black; the legs are long, slender, pilose, with a small brush on the tip of the anterior femora; tip of the anterior tibia, with a short membrane below, ending with a spine projecting on the tip. Wings hyaline, somewhat smoky, veins black, costa externally yellow; pterostigma dull yellow, narrow, elongate, cut obliquely on tip; below 1½ areoles; the base of the wings orange to the arculus, except the apical half of the basilar space; the transversals in the median space and all below them are clouded with black, forming with the dull orange areoles on the hind wing a brownish looking basal spot; the three basal antecubitals in the subcostal space faintly clouded with orange; membranula long, snow-white, black at tip; the angle of the hind wing not sharp, less than rectangular; front wing with 9 antecubitals. 7 postcubitals; hind wing with 6 antecubitals, 7-8 postcubitals; triangle of front wings with 3 areoles, internal triangle empty; triangle of hind wings with 2 areoles; two transversals in the median space; two series of discoidal areoles beginning with three; anal triangle of hind wings with 1 transversal; basilar space of all wings empty.

Female. Similar to the male; abdomen a little larger on tip; last segment pale, short, apical margin straight; appendages pale brown, blackish on tip, twice as long as the last segment, pilose, cylindrical, bent a little inside after the base, pointed on tip, vulvar lamina very short, with a large rectangular notch; the lateral quadrangular lobes with the apical margin thickened; earlets wanting, a very small tubercule is visible, femur less dark than in the male; apical half of the anterior tibia with a series of pale flattened scales like spines; wings similar, front pair with 11-10 antecubitals, 9 postcubitals; hind wings with 6 antecubitals, 10-9 postcubitals; the internal triangle of the fore wings with 3 areoles.

	Male	*Female*
Length of body with appendages	53	52
" " abdomen with "	40	40
" " ala sup.	34	36
" " ala inf.	33	35
" " pterostigma	2½	2½
" " appendages sup.	3	2½
" " tibia post.	7	7
Breadth of caput	7½	7½
" " ala sup.	8½	8½
" " ala inf.	11	11
Expanse of ala inf.	70	74

HABITAT: Mt. Yamaska, near St. Hyacinth, Province of Quebec, Canada.

The male was collected by the Abbé Provancher in 1875 and the female in 1877. There can be no doubt that both belong to the same species; the difference of the internal triangle of the fore wings, empty and without transversals in the male, with three transversals, united in the centre and forming 3 areoles as in the discoidal triangle in the female is in-

teresting, as in all the related species a lack of constancy in the venation is observed. This species is very similar to *E. obsoleta*, but the wings are narrower in proportion to the length. The other differences are given under *E. obsoleta*.

2. EPITHECA OBSOLETA.

Libellula obsoleta Say Journ. acad. nat. sci. Philad. 1839, ser. 1, v. 8, 28, 17: Ed Lec. v. 2, 402.

Didymops obsoleta Hagen Syn. Neur. N. A. 1861, 136, 2.

Epitheca? obsoleta Selys Syn. Cordul. 45, 25 — Hagen Proc. Bost. soc. nat. hist., 1873, v. 15, 269, 24.

Neurocordulia obsoleta Selys 2d. add. syn. Cordul., 1878, 28.

Libellula polysticta Burm. Handb. 1839, v. 2, 856, 53, ♂.[1]

Cordulia? molesta Walsh Proc. ent. soc. Philad. 1863, v. 2, 254, ♀.

Male. Pale dull olive brown; front and vertex pale olive, brownish pilose, strongly punctated, front excavated above; labrum yellow, labium paler; antennae pale brown; vertex convex above, narrowed to tip, which is half as broad as the base, nearly straight at the tip; occiput yellow, whitish pilose behind; behind the eyes yellow, some brownish marks in the middle, but rather small. Thorax pale olive brown, densely brownish pilose; dorsum with a darker broad dorsal stripe, shading off in the ground-color half way to the humeral suture; carina yellowish, sinus brown; a small yellow spot on each side of the dorsal stripe anteriorly near the prothorax; sides with cuneiform yellow spots around the stigmata, reaching to the bases of the legs. Abdomen long inflated at the base, contracted on third segment, gradually enlarged to tip, and somewhat depressed (in bad condition); more yellowish along the lateral border; transverse sutures black; articulation membrane pale; a round yellow spot near the border of each side of the

[1] I have always used the names of the American entomologist, Thomas Say, though I worked in Europe, and their priority over those of H. Burmeister is by no means certain. Say's paper was read 12 July, 1836; it was not published—I have never been able to learn why — until 1839. In my opinion the American entomologist can never lose priority by the unaccounted for delay in the publication of his paper.

Mr. Edward Doubleday (Mag. nat. hist., 1839, n. s. p. 141) says: "This paper [of Say] was not published when I was in Cambridge, Mass., in October, [1838] but Dr. Harris informed me that it would appear in the forthcoming volume [v. 8] of the Journal of the academy of natural sciences, of Philadelphia. . . . Epping, Feb. 18, 1839."

Say's paper was therefore not published 12 February, 1839, as Doubleday prints (l. c.) a list of Say's entomological writings, by the kindness of Dr. Harris, more complete than any that has yet appeared.

The exact date of publication of the monthly issues of the Journal from v. 2 to v. 6, p. 327 is given in the Proc. acad.. v.1, p. 57–59, and concludes with the notice that "the remainder of the Journal is published in half volumes." Volume 8 has simply the date 1839. At that date Burmeister's work was certainly in print and was published directly; but as I was in Norway and Sweden, I did not see it until the fall, when in Altona, at the house of Mr. Sommer, Burmeister's father-in-law. Priority hunters here and in Europe may do their work.

second segment; earlet brown shining, round, pointed behind; last segment (base injured) with the apical margin slightly produced in the middle, rounded, very slightly depressed. Superior appendages a little more than twice as long as the last segment, pale brown, pilose, closely approximated in the apical half; basal half cylindrical, curved slowly inwardly and inferiorly; gradually enlarged externally on the apical half, and tapering to the tip, which is short acute, recurved inwardly; viewed from the side the cylindrical basal half is somewhat contracted in front of the inflation of the apical half; inferior appendage a little shorter, pale brown, triangular, large at base, very much narrowed and recurved on the apical half, tip blunt with a small black tooth above. Genital parts wanting. Ventral lobe on the second segment small, brown, leaf-shaped, margins thicker, blackish. Legs pale brown, pilose, tibia externally yellowish, spines black; tarsi pale brown; anterior femora with a small brush on the tip; anterior tibiae with a short membrane below, ending in a spine projecting from the tip. Wings hyaline, broad, principally the hind wings, veins pale brown; pterostigma elongate, yellow, below little more than one areole; the antecubitals in the subcostal space surrounded by a yellow spot, a similar spot near the arculus; transversals in the median space dark brown; hind wings with similar spots, and an orange one filling the triangle near the anal border; angle of the hind wings oblique nearly rounded; membranula long, snow-white, apical half blackish; front wing with 7–8 antecubitals, 8 postcubitals; hind wing with 5 antecubitals, 7–9 postcubitals; both triangles of front wings with 3 areoles; discoidal triangle of hind wings with 2 areoles; 2 transversals in the median space of all wings; one transversal in the basilar space of the left hind wing; discoidal areolets beginning with 3, then 2 series for 2 areolets, followed by 3 not very regular series; anal triangle of hind wings with 2 transversals.

Female. Similar to the male; abdomen more robust, lateral margin of the segments paler; last segment very short, apical margin widely notched; appendages brown, black on tip, pilose, cylindrical, narrower at base, slightly bent outwards on tip, which is short, acute; tubercule between them brown, pilose, obtuse; vulvar lamina very short, with a large rectangular notch, almost attaining its base, sides rounded. Legs brown, tibiae yellowish externally, tarsi dark brown. Wings similar to the male, but slightly smoky, the costa yellow externally, all spots larger, a brownish spot on the base of the front wings near the hind border, and a larger brown band on the hind wings, ending on the interior angle of the discoidal triangle, leaving the extreme base of the wing hyaline; front wing with 7 antecubitals, and 7–8 postcubitals; hind wing with 5 antecubitals and 8 postcubitals; both triangles in front wings with 3 areoles; discoidal triangles in hind wings with two parallel transversals, of which in the right hind wing the basal one

rhinarium brownish in the middle; front advanced semicircular, somewhat flattened above, roughly punctated, slightly villous with pale hairs, front edge blunt; antennae blackish brown; between front and ocelli blackish; vertex short, transversal, rounded, roughly punctated with brown hairs; occiput yellow, rather pointed before; dilated posteriorly, rounded, impressed behind; eyes large, blackish, brown behind, with long white hairs; prothorax black, posterior lobe yellow, large elliptical; thorax villous, transversally finely striated, shining; dark brown, sinus yellowish brown, the same color shaded down somewhat on each side before the sinus; part of the lateral sutures and some not well-defined spots near the legs black; beneath pale brown with large blackish spots behind the legs; abdomen short slightly villous, slender, cylindrical, the base enlarged; blackish brown, segments 1–9 with an apical yellow transversal band with the basis on the third segment, and is nearly separated in the middle of segments 8 and 9; segment 10 as long as the 9th, convex above, with a basal median impression, black, shining; apical border straight slightly bent up; abdomen blackish beneath, the bordef of the segments somewhat paler in the middle, and on each side of segment three; second segment contracted in the middle, on each side with a large yellow earlet, rounded externally, pointed behind. Superior appendages a little longer than the last segment, separated at their basis, approached at their tips, straight cylindrical, the basal third flattened interiorly; after the first third externally below a small tooth and following to the tip inferiorly are six smaller ones; tip rounded with the appearance of a small soft point; inferior appendage a little shorter, triangular, strongly recurved, the point truncated; the appendages are black, hairy, the superiors pale brown on the tip, the inferior in the middle; genital lobe of the second segment triangular elongated; hooks long, bent, yellow, narrowed and brown on the tip; the spoon shaped elevator of penis enlarged on tip, yellowish. Legs black, moderately long, the hind ones passing the 3d segment of abdomen; femora below rough, a large number of very short teeth; tibiae with black cilia; claws of tarsi unequal, the apical longer; femur of fore leg with a little brush on tip; tibiae of fore legs with the membranous plate; wings hyaline, a small yellow spot on the extreme base of all; veins black, costa yellow; pterostigma yellow, small, the external side more oblique; antecubitals 7; postcubitals 5–6; all triangles without transversals; there is no inner triangle on the hind wing; one series of discoidal cells, the apical half beginning with two, later more; hind wings with the inner angle nearly rounded: anal triangle broad, with a transversal vein before the tip; membrane large, grayish white, ending on the transversal vein of the anal triangle.

Female. Similar to the male; the abdomen a little stouter, more enlarged at base, less retracted on the 3d segment, no earlets, but the place a little

inflated; colors similar but the transversal yellow bands larger and on the 3d and 4th segments extended into a median dorsal line; last segment short, black, shining, with a flat basal impression; appendages as long as the segment, converging, cylindrical, rounded on tip, black, hairy; part between them large, black rounded. Vulvar lamina large, broad, a little shorter than the segment, split to the basal third, pointed, tapering gradually to the tip, yellow; cavity bordered by it black, with an elevated ridge, pointed in middle.

	Male	*Female*
Length	34	33
Abdomen	24	20-23
Ala sup.	22½	23
Ala inf.	22	21½-22½
Pterostigma	2	—
Femur post.	5	5
Appendages	1¾	1
Exp. ala	47	48
Lat. cap.	6	5½
Breadth ant.	6	
" post.	7	

HABITAT: Center, N. Y.. Mr. J. A. Lintner, no. 2839, 27 May. 4♂; 2840, 21 May, 4♀. Two females (*L. vacua* Hagen, no descr.) from Saskatchewan, Lake Winnipeg, collected in 1860 by Robert Kennicott. The position of this rather eccentric, small species is near *C. ulheri*, but it is separated from that species by unusual characters. The anal angles of the hind wings of the male are nearly rounded; all triangles are without transversal veins; only one series of discoidal cells, and a very plain venation. It is very interesting that this apparently arctic species is found in eastern New York.

DESCRIPTIONS OF SOME NEW NORTH AMERICAN DOLICHOPODIDAE.

BY WILLIAM M. WHEELER, MILWAUKEE, WIS.

(*Concluded from p. 362.*)

PELOROPEODES, n. gen.

♂. Small dull metallic green species. Palpi prominent, though not enlarged. Antennae as long as the head and thorax; first joint stout, subcylindrical, glabrous on its upper surface, with a few hairs on its under side; second joint short, rounded, subcalyculate; third joint pubescent, very long, tapering from a broad rounded base to a blunt point, on which is inserted the thick, flexible arista. Face rather broad for a male, front ample. Thoracic dorsum moderately arched, beset with the usual stout setae; scutellum broad, short, smooth, with four setae. Abdomen with six segments, short, stout at the base but tapering very rapidly to the apex, where is attached the sessile and greatly enlarged hypopygium, consisting of a scuttle shaped box, two thirds the size of the abdomen, from the ventrad directed opening of which protude several hook-shaped chitinous appendages. Legs rather stout, hairy; tibiae equalling the femora in length; spurs of the fore tibiae short, those of the posterior pairs

of medium size; tarsi of all the feet somewhat longer than the tibiae; hind metatarsal joint without bristles. Wing somewhat longer than the body, slightly pointed; anal angle obtuse; fourth longitudinal vein slightly bent, entering the tip of the wing and scarcely inclined towards the end of the third longitudinal vein; second and third longitudinal veins straight, parallel; fifth longitudinal vein evenly curved, entering the posterior margin somewhat nearer the base than the apex of the wing; posterior cross vein perpendicular to the hind margin, distant about twice its length from the tip of the fifth longitudinal vein; sixth longitudinal vein short, distinct.

♀ of the same color as the male. Face rather broad, not attaining to the lower margin of the eyes. Antennae differing profoundly from those of the male; especially in respect of the third joint and its arista; the former being very short, semioval and flattened laterally, while the latter, inserted dorsally, and clothed with microscopic pubescence, is so long that if reflexed it would reach to the middle of the thoracic dorsum. Front ample; ocelli prominent. The rather large ovipositor, much exserted in all of my specimens, terminates in a comb-like organ with regular, short, blunt teeth.

(Generic name derived from πέλωρος, enormous, and ποώδης, provided with a large penis.)

PELOROPEODES SALAX, n. sp. ♂. ♀.

Length: ♂ 2.25 mm.; ♀ 2 mm.; length of wing ♂ 2.5 mm., ♀ 2.25 mm.

Dull metallic green. Palpi black. Face and front metallic green, almost obscured by whitish dust. Antennae black; pubescence of the elongated third joint of the male, whitish; bristles of the superior orbit black, those of the inferior orbit white. Thoracic dorsum dark metallic green, but so thickly covered with yellow dust, as to be subopaque in the male, opaque in the female; this dust is thickest on the anterior half of the thoracic dorsum; scutellum dusted with white with a metallic violet reflection; pleurae opaque, rather thickly covered with white dust. Cilia of the tegulae long, yellow. Metallic green ground color of the abdomen somewhat concealed by whitish dust; all the segments covered with sparse short black hairs; capsule of the hypopygium black, subopaque, with short appressed whitish pubescence on its lateral faces and a few short, irregularly placed setae in the median dorsal line; the numerous hook-like appendages pale yellow; ovipositor of the female yellowish red; teeth of its comb-shaped tip black. Fore coxae entirely yellow, beset towards their apices anteriorly with a few stout black hairs; posterior coxae with infuscated bases. Legs pale yellow, covered with rather stout black hairs, arranged in very regular rows on the tibiae; the posterior pairs have three spines on their posterior faces. Tarsi blackened from the tip of the first joint. Halteres yellow. Wings uniform grayish hyaline, somewhat pointed; base lanceolate; the portion of the fourth longitudinal vein beyond the posterior cross vein but very slightly bent, its end running parallel with that of the third longitudinal vein.

HABITAT: Milwaukee Co., Wis.

I have taken two males and three females of this species in a damp and rather dense wood where the undergrowth consisted very largely of *Boehmeria cylindrica* and *Impatiens fulva*.

CHRYSOTIMUS PUSIO, LOEW. ♂.

A number of females of this species captured on the foliage in damp woods near Milwaukee, agree with Loew's description except in the color of the antennae. According to Loew the antennae are "entirely black," whereas in all my specimens the two basal joints are honey yellow, while the third joint is

fuscous. The tergum of the last abdominal segment is also more blackish than metallic green. These differences are probably to be attributed to local variation. I subjoin a description of the male, which seems to have been unknown to Loew and which differs from the female in much the same manner as the male of the European *Chrysotimus molliculus*, Fallen, differs from its female.

Length: 1.5–1.75 mm.; length of wing 2.5 mm.

Bright golden green. Palpi blackish. Antennae with their two basal joints honey yellow; third joint fuscous, covered with distinct pale hairs. Cilia of the inferior orbit white; hairs and setae covering all other portions of the body honey yellow. The vivid metallic green of the thoracic dorsum and pleurae dimmed somewhat by a layer of whitish dust. Abdomen bright metallic green (venter yellowish?) of a shade differing from that of the thorax in being somewhat less golden and less subdued; hypopygium large and conspicuous; its outer portions brown, its inner appendages yellow. Legs honey yellow, the last tarsal joint on all the feet fuscous or black. Halteres yellow. Wings grayish hyaline. suffused with yellow, especially at their bases; veins honey yellow.

The six males before me were taken in company with the females of Loew's *C. pusio;* hence I believe there can be no doubt about their identity, especially since the relation that the sexes bear to each other is the same as that observed in the case of *C. molliculus*. My specimens have collapsed in drying so that I am unable to decide whether the venter is yellow, as in the European species.

APHANTOTIMUS, n. gen.

♂. ♀. Minute metallic green species, with rather thin integument, collapsing when dry; setae covering the body yellow; sexes alike in coloring. Palpi of moderate size. Antennae alike in both sexes; first joint short, smooth; second short and broader, provided with the usual hairs; third joint small, narrower than the second, spheroidal, with rather long, apically inserted and microscopically pubescent arista. Face rather broad in both sexes, narrowed below, not reaching to the lower corners of the eyes. Head situated rather deep on the thorax to which it seems to be closely applied. Thorax resembling in its shape the thorax of *Chrysotimus;* in the prescutellar region there is an extensive though shallow indentation, the exact shape of which my dried and collapsed specimens do not enable me to determine. Abdomen laterally compressed, in the male of six segments, tapering rapidly; hypopygium very large, pedunculate, distinctly flexed under the venter, capsule hood-shaped, with exserted appendages; a pair of these, apparently homologous with the lamellae of the hypopygium of *Dolichopus* and *Gymnopternus*, are disk-shaped and fringed with cilia; ovipositor large, usually exserted, resembling that of *Chrysotimus*. Legs rather smooth, with short and appressed spines; tibial spurs feebly developed; in the spinulation of the legs little or no sexual differences. Wings thin, hyaline, rather large; costa rather prominently arcuate; anal angle not very prominently projecting. Neuration resembling that of *Chrysotimus;* posterior cross vein more than twice its length distant from the border of the wing; fourth longitudinal vein gently bent beyond the posterior cross vein, and ending at or a little in front of the tip of the wing. With this vein the third longitudinal vein runs parallel and is in one species nearer to it than to the second longitudinal vein; second and third longitudinal veins presenting the same gentle curvature as the fourth.

(Generic name drived from ἄφαντος, forgotten, and τιμή, honor.)

The species of *Aphantotimus* resemble the *chrysotimi* in having yellow hairs and setae; in the prescutellar indentation, in the neuration of the wings and in the apical insertion of the antennal arista. The females, however, resemble the males in coloring, and do not have the abdomen largely yellow. The hypopygium of *Aphantotimus* is disengaged and very large, thus resembling that of the higher genera like *Dolichopus* and *Gymnopternus*; while the hypopygium in *Chrysotimus* is small and partly embedded. There are also differences in the size and shape of the third antennal joint; though this character is not of generic value.

The two minute species here described, differ considerably in the structure of the hypopygium, but to just what extent I have not ascertained, as this organ must be examined in recently killed specimens. Their close resemblance in other respects, e. g. in the structure of the antennae, neuration of the wings, shape of the body and covering of yellow hairs, leads me to unite them in the same genus.

APHANTOTIMUS WILLISTONI, n. sp. ♂. ♀.

Length 1.5–1.75 mm.; length of wing 1.5 mm.

Palpi pale yellow. Face metallic green, smooth; covered with a thin layer of yellowish dust, composed of minute scales that are clearly discernible, and not closely aggregated. Antennae entirely black, inclining to piceous or brown when viewed from their apices; third joint somewhat conical at the insertion of the arista and covered with scarsely perceptible pubescence. Front rather broad, blackish green, covered with the same dust as the face; frontal setae and those of the thorax and abdomen pale yellow; cilia of the inferior orbit yellow. Thoracic dorsum and scutellum golden green, overlaid with yellow dust, consisting of minute scales; pleurae bright golden green, less dim than the thoracic dorsum, growing black in the region of the tegulae. Cilia of the tegulae yellow. Abdomen bright metallic green, with a more violet than golden reflection; covered with short and stiff yellow hairs; in the female the exserted ovipositer is orange yellow; in the male the large hood-shaped hypopygial capsule is shining black, changing to metallic green in some lights; appendages pale yellow; the two lamellae rounded, fringed with yellow cilia; a long and exposed blade-shaped organ (the penis?) extends from the base to the tip of the hypopygium on the ventral side. Legs pale yellow; tips of the tarsi scarcely darker, covered with short brown hairs, which turn to yellow in some lights. In the male the fore coxae are fuscous anteriorly and basally; the posterior coxae are fuscous with yellow tips; in the female the coxae are largely pale yellow, there being only a large fuscous spot at their bases. Halteres large, yellowish white. Wings brownish hyaline with brownish veins; the third and fourth longitudinal veins parallel, and more approximated to each other than the third longitudinal vein is to the second.

HABITAT: Milwaukee Co., Wis.

The single male and three females in my collection were taken on the foliage in a swampy wood in company with hundreds of Dolichopods belonging to the genera *Dolichopus*, *Pelastoneurus*, *Sympycnus*, *Psilopus* and *Chrysotus*.

APHANTOTIMUS FRATERCULUS, n. sp. ♂. ♀.

Length 1–1.5 mm.; length of wing 1.25 mm.

Palpi brown, with white hairs. Face, front and occiput metallic green, covered with yellowish dust. the separate scales composing which are distinctly discernible as in the preceding species. Antennae black. resembling in structure those of *A. willistoni*. Cilia of the inferior orbit yellow. Thoracic dorsum bright metallic green with bluish reflection; the thin covering of dust and the comparatively few setae yellow; prescutellar depression very distinct, somewhat v-shaped; pleurae vivid metallic green, covered with a thin layer of yellow dust. Tegulae pale yellow, cilia yellow, changing to brown in some lights. Scutellum and abdomen vivid metallic green with violet and cupreous reflections, the rather long hairs on the latter pale yellow; venter and hypopygium black, the latter roughened, metallic green dorsally; appendages pale yellow. The capsule of the hypopygium is narrower and somewhat longer than in the preceding species; the long, blade-shaped appendage dark brown; the two lamellae dirty yellow with black tips, apparently without cilia on their edges. In the male, coxae and legs black, the former with yellow, the latter with black hairs. Femora with a faint metallic green luster; knees broadly yellow; trochanters, inner faces of the tibiae and bases of the separate tarsal joints dirty yellow. In the female the femora and tibiae are bright metallic green, the knees and trochanters yellow, the tarsi black. Halteres pale yellow. Wings faintly brownish hyaline; third and fourth longitudinal veins less approximated than in the preceding species; perfectly parallel and but very slightly curved from the posterior cross vein on. The fourth longitudinal vein terminates in the tip of the wing.

HABITAT: Milwaukee Co., Wis.

This species is very readily distinguished from *A. willistoni* by its smaller size, the more bluish and less golden reflection of its metallic surfaces, its dark-colored legs and the neuration of the wings. Three males and one female were taken with the preceding species.

XANTHOCHLORUS HELVINUS, LOEW. ♂.

Loew felt some doubt as to whether this species, which he described from female specimens only, was not merely a variety of the European *X. tenellus*. An examination of a number of males taken by me in several localities in the vicinity of Milwaukee, seems in no way to invalidate the species. In these specimens I can detect no green markings whatsoever. The general honey yellow color of the body is departed from only on the cheeks and front, which are has gray and on the pleurae, where I find two clearly defined black spots; one larger and more pronounced just back of the tegula and another smaller and more oval spot (not mentioned in Loew's description) on the metathorax just beneath the lateral edge of the scutellum. The powerful bristles on the head and thoracic dorsum, as well as the cilia of the tegulae and the hairs covering the other portions of the body are dark brown, almost black, thus contrasting with the yellow body color. The hypopygium is prominent, though hardly "dick angeschwollen" as is the case in the European *X. tenellus*, Wied, according to Schiner. The acute hypopygial appendages scarcely project and are honey yellow. The bases of the second, third and fourth abdominal segments are infuscated in dried specimens.

HYDROPHORUS PHILOMBRIUS, n. sp. ♂.

Length 3.5 mm.; length of wing 4 mm.

Dull olive green. Face bright metallic green, covered with white dust, which scarcely dims the brilliant ground color, except on the oral margin, where it is aggregated to form two spots, one on each side abutting on the orbit. Cheeks and palpi black, clothed with short appressed yellow pubescence; the pubescence on the eyes short and silvery white. Antennae black, pubescence on the third joint white, tip of the robust arista pale. Front and occiput of a blackish ground color, covered with glistening white dust which gives them a frosted appearance; cilia of the superior orbit black; those of the inferior orbit glistening white, but becoming tawny near the oral orifice. Thorax, scutellum and abdomen covered with the same frost-like dust as the front; as this dust, which consists of microscopic scales, is wanting about the insertion of each seta, the surface has a spotted appearance. The disk of the thoracic dorsum is crossed by four longitudinal shining purple bands, the outer pair being slightly broader than the inner; the spaces between these bands are vivid metallic green. Scutellum bearing four rather long black bristles; its median portion golden green, the lateral portions coppery red. Pleurae dull olive green, more olive brown towards the insertions of the coxae. Tegulae honey-yellow, with glistening white cilia. Abdomen olive green, in rear view more bluish; the rows of impressed dots along the tergal edges shining black; the sparse hairs covering the terga of the basal segments and the whole venter, glistening white; hypopygium black, concealed, appendages not apparent in my specimen. Legs and coxae covered with white dust; the fore pair of legs black; fore coxae dull metallic green, fore femora incrassated in the usual manner and bearing a few long spines at their bases on the under side; on the hind face of the distal two thirds of the fore tibiae there is an even comb of stout black spines; apical claw distinctly marked though not acute; the distal half of the fore tibiae and black tarsi with short and dense white pubescence. Posterior femora and tibiae slender, vivid metallic green; posterior tarsi with white pubescence somewhat more scattered than on the fore tarsi. Pulvilli and empodia of all the feet white, fringed with silvery hairs. Halteres bright honey yellow, the base of the peduncle somewhat infuscated. Wings long and narrow, costal and posterior margins parallel, uniformly grayish hyaline; veins black, becoming yellow near the insertion of the wings; third and fourth longitudinal veins gently approximating near the tip of the wing, but again diverging slightly at their juncture with the costa; sixth longitudinal vein very short and incomplete.

HABITAT: Milwaukee Co., Wis.

This large and beautiful species seems to be related to the Alaskan *Hydrophorus innotatus*, Loew. It may be distinguished by the white dust on the face and front, the glistening white cilia of the inferior orbit, the vittate thoracic dorsum, the bright yellow halteres and the yellow bases of the nervures of the wing.

It is possible that the species which I here call *H. philombrius* is one of the two species mentioned by Baron v. Osten Sacken (Western Diptera p. 320.) "One from Webber Lake, Sierra Nevada (July 25) is allied to *H. innotatus*, Loew from Sitka (Monogr. 2 p. 212) in the coloring of the face, the upper part of which is greenish, and in other characters; its halteres, however, have a yellow, and not an infuscated knob. The other species, taken near Santa Barbara (January 25), is easily distinguished by the

color of its first longitudinal vein, which is brownish yellow; the costa beyond the insertion of the first vein is of the same color."

Entomological Notes.

Prof. F. H. Snow has been elected chancellor of the Kansas State University at Lawrence. Princeton College at commencement last June conferred the degree of LL. D. upon Chancellor Snow.

JUNONIA COENIA.—In a letter to Mr. S. H. Scudder, Mr. Justus W. Folsom writes "On 30 July 1890 I saw an unmistakable specimen in Cambridge, Mass., on flowers of *Nepeta cataria* bordering the Charles river. The insect was apparently in perfect condition."

Mr. C. J. Maynard's work on the butterflies of North America will make an octavo volume of about 200 pages, illustrated with many wood-cuts. The descriptions are short and comparative. De Wolfe, Fiske & Co. of Boston are the publishers.

Mr. H. T. Fernald, a son of Prof. C. H. Fernald, of the Massachusetts Agricultural College, has completed a post graduate course in biology at the Johns Hopkins University, receiving the degree of Ph. D., and has been elected professor of zoölogy in the Pennsylvania state college. The Johns Hopkins University Circular (No. 80 April 1890) contains his "Studies in thysanuran anatomy," a preliminary communication.

BRITISH ORTHOPTERA. The July issue of the Entomologist's monthly magazine contains the conclusion of Mr. Eland Shaw's "Synopsis of British orthoptera." The list of species includes,

6 Forficulidae,
7 Blattidae,
14 Acrididae,
10 Locustidae and
5 Gryllidae, a total of 42 species. of which 3, *Anisolabis maritima*, *Phaneroptera falcata* and *Oecanthus pellucens* are included with some doubt. The synopsis was commenced in the number for August 1889, and altogether fills a little over 50 pages.

NEUROPTERA OF IRELAND. In his catalogue of the neuroptera of Ireland (Proc. & Trans. nat. hist. soc. Glasgow, 1890, n. s. v. 2, p. 259-292) Mr. James J. F. X. King gives the following comparative summary of the genera and species of neuroptera occurring in Ireland, Great Britain and Belgium.

	Ireland.		Great Britain.		Belgium.	
	Genera.	Species.	Genera.	Species.	Genera.	Species.
Psocidae	7	26	10	38	7	22
Perlidae	6	11	9	24	8	21
Ephemeridae	11	23	13	37	16	28
Odonata	15	25	22	45	24	64
Planipennia	6	23	14	51	15	56
Trichoptera	28	103	61	155	57	136
Total	73	211	129	350	127	327

TERMITES INJURIOUS TO GROWING TREES.—Mr. Henry Tryon mentions (Queensland Department of agriculture, Report on insect and fungus pests, No. 1, p. 228-229) that complaints concerning injuries to growing trees by termites are common in the western and northern parts of the colony. The termites find their way into the tree through some accidental opening or weak spot; frequently they start at the collar of the tree or just at the surface of the ground and thence work upwards.

Mr. Tryon does not identify the species; he states that all kinds of shade and fruit trees are attacked except those belonging to the orange family. In Florida termites frequently injure orange trees though old and well established trees are little liable to their attacks.

FOOD-PLANT OF CARPOCAPSA SALTITANS. —The food-plant of this tortricid, the larva of which is the cause of the so-called "Mexican Jumping seeds," has been a matter of considerable doubt. At a meeting of the natural history society of Glasgow, held 26 March 1889 (Proc. & trans., 1889, n. s. v. 3, p. 26 Proc.) Mr. A. Somerville showed specimens of *Carpocapsa saltitans* Westw., bred from the seed vessels of *Colliguaja odorifera*. This plant, one of the euphorbiaceae, is a native of Chili, and was first described by Molina (History of Chili, English ed., v. 1, p. 291). Hooker (Bot. misc., 1830, v. 1, p. 142, pl. 40) also describes and figures the species and mentions that plants introduced into greenhouses in Scotland thrive well. In Chilian Colliguaja it is called "pichroa" and from early times has been used medicinally. The moth was originally described by Westwood (Proc. Ashmolean soc. Oxford, 1857, v. 3, p. 137-138: Trans. ent. soc. London, n. s., v. 5, p. 27, Proc. for 7 June 1858) from specimens bred from seed received from Tassic, Mexico (cf. Trans. ent. soc. London, n. s., v. 4, p. 90, Proc. for 5 October 1857 and op. cit., n. s., v. 5, p. 8, Proc. for 1 March 1858. See also Gardener's chronicle 12 November 1859, p. 909). Westwood gives the habitat as "Larva in seminibus plantae Peruvianae Calliguaja dictae, quae motu saltatorio mire progrediuntur." Subsequently the species was described by Lucas as *Carpocapsa dehaisiana* (see Ann. soc. ent. France, 1858, s. 3, v. 6, p. 10. 33, 41-44, Bull; ibid, 1859, s. 3, v. 7, p. 561-566: C. R. acad. sci. April 1858, v. 46, p. 685-689: Rev. et. mag. zool., April 1858, v. 10, p. 171-177: ibid, November 1858, p. 470-484, pl. 16: L'Institut, 1858, v. 26, p. 127-128).

Riley (Trans. acad. sci. St. Louis, 1876, v. 3, p. 190-191, Proc.) mentions, on the authority of Mr. G. W. Barnes of San Diego, Cal., that the plant is called Yerba de flecha and Colliguaja by the Mexicans, and in the Proc. U. S. nat. mus., 1883, v. 5, p. 632-635 states also on the authority of Mr. Barnes "that the region of Mamos in Sonora is the only place where the plant grows."

REVISION OF THE MANTIDAE. Prof. J. O. Westwood's recently issued work on the mantidae entitled "Revisio insectorum familiae Mantidarum, specibus novis aut minus cognitis descriptis et delineatis" consists of a synonymical and bibliographical list of the species, an appendix with descriptions of six new genera and one hundred and eight new or little known species, a bibliography of the family, an alphabetical index of the genera, species and synomyms, a page of corrections and additions and three pages explanatory of the fourteen lithographic plates. One hundred and eight species are figured. In the list Prof. Westwood recognizes sixteen groups, 154 genera and 645 species. There are however some duplications in the list and a few additional names are given in the addenda. The Palaearctic region has twenty-two genera and sixty-seven species; five of the genera are strictly confined to this region. The Nearctic region is especially poor in species, there being but ten in the list and of these *Stagomantis dimidiata* is a dimorphic form of *S. carolina*. Of the six genera none are peculiar to the region. The species are,

102. Gonastista grisea Fabr. N. Amer.
123. Oligonyx uhleri Stal. La.
125. scudderi Sauss. Geo?
128. graminis Scudd. Fla.
132. Thesprotia baculina Bates. St. Johns' Bluff, E. Fla.
163. Mantis wheeleri Thomas. Colorado.
355. Stagomantis carolina Linn. N. Amer. Ill. Car. Mex.
356. dimidiata Burm. Amer. Pa. to Buenos Ayres.
359. minor Scudd. Neb.
607. Pseudovates chlorophaea Blanch. U. S.

The Neotropical region is very rich in species, about 175 being listed. There are twenty-nine genera exclusively confined to this region. The Australian region with 64 species has but six peculiar genera. The Oriental region has 165 species and thirty genera not found in any other region and the Ethiopian region with 168 species has the largest number of peculiar genera, namely thirty-two.

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CONTENTS:

ADVERTISEMENTS 382
NOTES AND DESCRIPTIONS OF SOME NORTH AMERICAN LIBELLULINA.—*Hermann August Hagen* 383-387
SYNONYMY OF THE HOMOPTERA DESCRIBED BY SAY, HARRIS AND FITCH. *E. P. Van Duzee* 387-391
A NEW CECIDOMYIID INFESTING BOX ELDER.—*C. P. Gillette* 392-393
PREPARATORY STAGES OF CERURA MULTISCRIPTA, RILEY.—*Harrison G. Dyar* 393-395
NOTES ON THE EARLY STAGES OF TWO SPHINGIDAE.—*Alpheus Spring Packard* 396-401
NOTE ON TWO SPECIES OF DATANA.—*William Beutenmüller* 401
EDWARDS'S BIBLIOGRAPHY OF TRANSFORMATIONS 401-402
DO FLIES MIGRATE?—*Samuel Hubbard Scudder* 402-403
THE SUPPOSED BOT-FLY PARASITE OF THE BOX-TURTLE.—*William M. Wheeler* 403
AN INTERNAL DIPTEROUS PARASITE OF SPIDERS.—*James Henry Emerton* . 404
ENTOMOLOGICAL NOTES 405-406

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PSYCHE.

NOTES AND DESCRIPTIONS OF SOME NORTH AMERICAN LIBELLULINA.

SYNOPSIS OF NEUROPTERA, SECOND EDITION.

BY HERMANN AUGUST HAGEN, CAMBRIDGE, MASS.

1. CELITHEMIS EPONINA Drury.

I first established *Celithemis* for this species which is found everywhere in the United States, east of the Rocky Mountains from Minnesota to Florida and Texas; it also occurs in Cuba. It is rather variable in the spots of the wings.

2. CELITHEMIS FASCIATA Kirby.

Kirby, Trans. zool. soc. London, 1889, v. 12, p. 326, pl. 52, f. 2. Two males, one immature from Georgia. In the exhibition of Canadian insects (1886) in London, England, a young male said to be from Toronto, Ontario, was labelled by myself *C. anna* (no description), after two males from Enterprise, Fla. The female is unknown to me. I believe this species is near to *C. eponina* of which I have before me a large number from Enterprise. The discovery of the female is still needed.

3. CELITHEMIS ELISA Hagen.

I have placed this species in my Synopsis (1861, p. 182) in *Diplax* followed by *D. ornata* and *D. amanda*, of which I had then before me very insufficient material. Walsh directly referred *D. elisa* to *Celithemis* and Kirby (l. c., p. 275) proposed the same for *D. ornata* and *D. amanda*. I have now before me a large material ranging from Canada to Georgia. The species is very remarkable in having the tips of all the wings blackish as in *C. fasciata;* all the other spots are more or less variable.

4. CELITHEMIS BALTEATA Hagen.

I have described the young female from western Texas in my Synopsis (1861, p. 140) among *Tetragoneuria* with the remark, "Does it belong to this genus?" Later I sent this female and the only male from Cuba (Poey) to DeSelys and he answered " a Libellula but difficult a placer." I have since received both sexes and fully colored specimens from Key West, Fla. There is no doubt but that the species belongs here and stands, though a little larger, between *C. elisa* and *C. ornata*. By a curious chance this species is omitted from my Synopsis of 1875. A new and full description is needed.

5. CELITHEMIS ORNATA Ramb.

Instead of two specimens mentioned in my Synopsis (1861, p. 182) I have a large number from the eastern parts of the United States and I have been told by Mr. Calvert that it has been collected in Maine.

6. CELITHEMIS AMANDA Hagen.

I have in my Synopsis (1861, p. 183) described this species after the type (♀) of Burmeister from Georgia (his *Libellula pulchella*, a name used long before) as the next to *D. ornata*, having only two series of discoidal areolets. I have now before me a larger material, some collected with *D. ornata* and I think it very probable that both forms may be the same species and perhaps may be found in South America also.

The other species *C. superba* given in my Synopsis, (1861, p. 148) of which I had then only a female is now referred to a separate genus, *Pseudoleon* Kirby. There are believed to exist four species, of which I can not now give an opinion. I believe that it is very near to *Celithemis*.

7. LIBELLULA INCESTA Hagen.

Teneral male, Front yellowish, superiorly darker with a black transversal band before the eyes; labrum yellow, margin black; labium paler, the outer and inner margin finely black; vertex brown, paler in the middle; occiput brown; eyes black behind two yellow spots on the inferior half of the border; prothorax brown, two spots in the middle and the posterior lobe yellowish white. Thorax brown with a yellowish white band extending between the wings to the abdomen; sides yellowish white with an inferior blackish band above the legs, formed by four triangular spots; suture between meso- and metathorax with a superior blackish line; thorax beneath whitish, the black spots extending down between and behind the legs. Abdomen blackish brown with a broad yellowish band each side, paler and larger on segments 2–3, united on 1 and on the base of 2; very near to the outer border of the segment, which is finely black, on segments 3–9; segment 10 yellow with two black spots in the middle; abdomen beneath yellow, margin of the segments finely bordered with black; venter brown; appendages black, the inferior brown in the middle. Legs black, pale at the base, anterior femora pale brown above nearly to tip. Antecubitals 15–18 (12–13 ala inf.); postcubitals 11–13; 3½–4 areolets beneath pterostigma; 3 discoidal areolets; after the triangle sometimes 4; 1-2 transversals in the triangle. Length 53 mm.; abdomen 36 mm; ala sup. 41 mm.; ala inf. 83 mm.; pterostigma 5½ mm.; appendages 2½ mm.; cap. 8.

HABITAT: Two males, Milton, Massachusetts July 1873 H. K. Morrison.

There are no differences between *L. incesta* and *L. lydia* except that the basal line and nodal point are fuscous black in the latter; *L. incesta* is generally smaller; the pterostigma is shorter. When I described *L. incesta* (Synopsis, 1861, p. 155) I had before me only two very old males from Carolina. Now

I have a dozen of both sexes young and adult from Canada to Florida. With an equally large material of *L. lydia* and of *L. axillena* it seems to be certain that all belong to the same species.

8. DIPLAX RUBICUNDULA Say.

Libellula rubicundula Say, Journ. acad. nat. sci. Philad. 1839, ser. 1, v. 8, 26, 14.

Diplax rubicundula Hagen, Syn. Neur. N. A. 1861, 176, 6—Proc. Bost. soc. nat. hist. 1873, v, 15, 267, 17; 377, 10; 1875, v, 18, 73, 3 — Scudd. ibid, 1866, v, 10, 219.

Rufescent front and mouth parts yellowish; a narrow black band before the eyes between vertex and front; vertex brown, paler on tip, villous; eyes rufescent in life, behind olivaceous with two transversal darker marks; antennae black; prothorax rufous, hind border with two large rounded lobes, densely ciliated on border, thorax rufous, (♂) greenish brown (♀), sides same color more yellowish beneath; legs black, anterior femora sometimes the intermediate and posterior, luteous beneath at the base; abdomen long, slender, saguineous (adult male), or yellowish with a maculose lateral black stripe, except at the base (♀); appendages, rufescent; superior ones of the male longer, apical half recurved, apex acute, beneath upon the middle with a stouter tooth, denticulated anteriorly; inferior appendage shorter, triangular, exceeding somewhat the tooth of the superior ones, the apex a little excised; the genital hamulus rather long, very bifid, the external branch broader, triangular; the internal one a little longer, narrow, subincurved; the genital lobe short, triangular; the apex narrow; anterior plate widely notched on the tip; penis with two shorter pale apical setae; appendages of female cylindrical, pointed; vulvar lamina small, triangular, the base inflated, bifid by a channel to the base, forming two conical pointed, recurved lobes; concave inside; wings hyaline, the extreme base yellowish; pterostigma quadrangular, fuscous, at both sides paler; membranule white; antecubitals 7 (8); postcubitals 7 (7-9); 3 discoidal areolets.

Length 32-37 mm; alar expanse 50-58 mm.; pterostigma 2 mm.

HABITAT: Massachusetts summer to very late fall; New Hampshire, August, September; Maine; New York; New Jersey; Pennsylvania; Maryland; Washington, D. C.; Indiana (Say); Illinois; Lake Superior; British America;

9. DIPLAX MADIDA Hagen.

Diplax madida Hagen Syn. Neur. N. A. 1861, 174,2—Proc. Bost. soc. nat. hist. 1875, v. 18, 80, 11.

Rusty brown, subvillous; front and mouth parts, paler, reddish, vertex, inflated, reddish, tip truncated a little notched; occiput pale brown, villous behind; antennae black; eyes behind yellowish, with three dark brown transversal bands; prothorax darker above; the hind border with two paler large rounded lobes, densely ciliated on the border; thorax dark rusty brown

with brown hairs, lateral sutures near the wings blackish; thorax of the female sometimes of a paler shade on the sides above and before the legs; legs black, trochanters red; anterior femora of the female pale on the basal half below; abdomen reddish. of the female sometimes paler, with the base of the 1st and 2nd segments, the dorsal suture about the 8th and 9th segments, and a lateral stripe in some segments blackish; most of the females with the abdomen reddish without any marks; appendages of the male as long as the penultimate segment, reddish, cylindrical, straight, the pointed tips subdivergent; viewed laterally truncated obliquely at the tip, below with a series of about seven small black teeth in a line before the apex, which is bent upwards, notched with two apical small teeth above; the genital hamulus dark yellowish, forming an elongated plate, concave internally, rounded at the tip; interiorly before the tip, a small but strong black bent hook, penis dark, with two long curved apical setae; anterior plate deeply split, black, bilobate; genital lobe short, narrow, contracted before the rounded tip; appendages of the female shorter than the penultimate segment, pale reddish, cylindrical, pointed: between them a large reddish conical lobe; vulvar lamina yellowish, short, with an angular excision, forming two triangular lobes with a somewhat blunt tip, concave inside.

Wings fumose, the anterior margin and the base more in the hind wings extending beyond the base, flavescent: veins brown; pterostigma long, narrow reddish; in the females more yellowish, at least below; membranule white; antecubitals 8 (6-9); postcubitals 8 (6-9); 3 discoidal areolets. Length 38-41 mm.; alar exp. 58-64 mm.; pterostigma 3 mm.

HABITAT: Montana 8 August. Three Buttes near head of Milk River; Upper Missouri, Yellowstone (Konopicky); Gulf of Georgia, California, (A. Agassiz); Victoria, Vancouver Island, July (Crotch, H. Edwards); California (H. Edwards.)

This species was described in my Synopsis from the rudiment of a female preserved for a long time in alcohol; thus the paler colors are explained. I have seen 15 specimens male and female.

10. DIPLAX FLAVICOSTA Hagen.

Diplax flavicosta Hagen, Proc. Bost. soc. nat. hist. 1875, v. 18, 81, 13.

A pair caught in copula at San Diego, California by Mr. Crotch induced me to separate them as species. The size and external appearance is similar to *D. madida*. The wings are hyaline, with the anterior margin to the mediana and a small space at the base of the hind wings flavescent. The male is similar to *D. madida* but the superior appendages have about a dozen small teeth on a line beneath the apical half. The female has on each side of the thorax an oblique pale band, better defined and broader near the legs; on each side along the abdomen a black band is indicated and is more developed at the apex of the segments; the dorsal median

edge is blackish on the 8th and 9th segments, the vulvar lamina with the lobes more pointed on the tip, and better separated at the base.

If *D. flavicosta*, as I believe, is merely a variety of *D. madida*, four smaller females from Victoria, Vancouver Island, July, can not be separated. The smallest is 31 mm. in length; alar expanse 50mm.; pterostigma 2 mm. The wings are fumose, the anterior margin flavescent in one, another has the base to the nodus or only beyond the triangle flavescent; the anterior pale band on the sides of the thorax is plainly visible; a large black band on each side of the abdomen is complete; in one female the black extends from the end of the segments to the middle ridge.

SYNONYMY OF THE HOMOPTERA DESCRIBED BY SAY, HARRIS AND FITCH.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

In the *homoptera* as in other branches of our favorite science a solid foundation was laid by that illustrious pioneer of American entomology, Thomas Say, whose brief but concise descriptions of many of our native insects have elicited universal commendation from later students. Scarcely inferior to that of Say is the work done many years later by Asa Fitch most of whose numerous species may be readily recognized from his short, clear diagnoses. Intermediate in point of time comes the work of Thaddeus William Harris to whom, however, we owe the description of but very few homopterous insects. In the present paper I propose to give the corrected nomenclature of the *homoptera cicadinae* described by these honored leaders of American entomology so far as it is known to myself or has been made known by recent writers.

Many of these names have been in common use for years, but a number are to be found only in rare or little known papers, and not a few are now for the first time systematically placed. In a few cases where I still feel in doubt the reference is followed by a question point.

Of the 71 species described by Say 60 are known to me; all of those described by Harris, 6 in number, and all but 15 of the 74 species described by Fitch. Two of those described by Say, viz., *Jassus sanctus* and *Membracis subulata*, are, so far as I can learn, unknown to our later entomologists. In the *cicadidae* and *typhlocybidae* I have quoted all references from the studies of Messrs. Uhler and Woodworth whose valuable synonymical notes on these families may be found in Ent. Amer. v. 4, 21 and 81, and PSYCHE,

v. 5, p. 67 and 211. In these cases as in others where I have not personally studied the insect I have appended my authority for the name employed. To species still unknown to me in nature I have prefixed an asterisk.

The following species require no change of name to bring them into correspondence with our modern nomenclature.

DESCRIBED BY SAY:

Cicada dorsata.
* " marginata.
* " vitripennis.
Aphrophora 4-notata.
Tettigonia bifida.
" hieroglyphica.

DESCRIBED BY FITCH:

* Anotia burnetii.
* " robertsonii.
* " westwoodi.
Bruchomorpha dorsata.
Ceresa brevicornis.
" taurina.
* Cicada superba (auct. Woodworth).
* Cixius cinctifrons (auct. Ashmead).
* Cixius coloepium (auct. Ashmead).
Cixius pini.
Clastoptera proteus.
* " pini (auct. Ashmead).
* Clastoptera testacea (auct. Ashmead).
* Cyrtosia fenestrata (auct. Uhler).
Eucanthus orbitalis.
Gypona flavilineata.
" scarlatina.
Helochara communis.
Idiocerus alternatus?
" lachrymalis.
" maculipennis.
" pallidus.
" suturalis.
* Naso robertsoni (auct. Uhler).
Otiocerus amyoti.
* " kirbyi.
" signoreti.
Pediopsis trimaculata.
" viridis.
Penthimia americana.
Telamona concava.
" coryli.
" fasciata.
" reclivata.
Tettigonia tripunctata.
Thelia crataegi.

Some of them will doubtless prove on further study to be but varieties of other forms and a few may yet have to be placed as synonyms of earlier described species.

The following names required to be changed.

DESCRIBED BY SAY:

Aphrophora bilineata = Philaenus lineatus Linn.
Cercopis bicincta = Monecphora id.
Cercopis obtusa = Clastopera id.
Cercopis parallela = Aphrophora id.
Cercopis 4-angularis = Lepyronia id.
* Cicada aurifera = Cicada marginata Say (auct. Woodworth).
Cicada hieroglyphica = Tettigea id, (auct. Uhler).
Cicada parvula = Carineta id. (auct. Uhler).
Cicada pruinosa = Cicada tibicen

Linn. (auct. Woodworth), probably a variety.

Cicada rimosa =Tibicen id. (auct. Woodworth).

Cicada synodica = Tibicen id. (auct. Woodworth).

Delphax tricarinata.

No genus yet established seems properly to include this species.

Flata bivittata = Amphiscepa id.

Flata bullata = Thionea id.

* Flata conica.

This name is not changed by Mr. Ashmead. (See Smith's Cat. Ins. of New Jersey, p. 438.)

Flata humilis = Oliarus id.

Flata nava = Phypia (?) id.

* Flata opaca = Helicoptera id. (auct. Uhler).

Flata pallida = Helicoptera id.

Flata pruinosa = Ormenis id.

Flata 5-lineata = Oliaris id.

Flata stigmata = Cixius id.

Fulgora sulcipes = Scolops id.

Jassus acutus = Platymetopius id.

Jassus clitellarius = Thamnotettix id.

Jassus immistus = Scaphoideus id.

Jassus inimicus = Deltocephalus id.

Jassus irroratus = Phlepsius id.

Jassus novellus = Agallia id.

Jassus olitorius = Jassus (as restricted by Stål) id.

Jassus seminudus = Athysanus id.

Jassus subbifasciatus = Jassus olitorius Say ♀.

* Jassus verticis.

Mr. Uhler places this as congeneric with *Idiocerus pallidus* Fh. and *ramentosus* Uh. Possibly it will prove identical with *Idiocerus alternatus* Fh. which name it would then supercede.

Membracis arquata.

This is congeneric with an undescribed form placed by Mr. Uhler in *Ophiderma* Fairm., but the transverse apical cell of the elytra will perhaps entitle them to generic distinction.

Membracis belligera = Platycotis id.

Membracis binotata = Enchenopa id.

Membracis calva = Acutalis id.

Membracis concava = Publilia id.

Membracis diceros = Ceresa id.

Membracis festina = Stictocephala id.

Membracis goniphora = Stictocephala inermis Fab.

Membracis inornata = Atymna id.

Membracis latipes = Campylenchia curvata Fab.

Membracis marmorata = Carynota id.

Membracis mera = Carynota id.

Membracis 4-vittata = Platycotis id.

Membracis semicrema = Acutalis id.

* Membracis tartarea = Acutalis id. (auct. Uhler).

Membracis trilineata = Cyrtosia id.

This may prove to be a synonym of *C. mutica* Fab.

Membracis vau = Cyrtosia id.

Tettigonia basilaris = Typhlocyba id. (auct. Woodw.)

* Tettigonia coagulata = Homalodisca id. (auct. Stål).

Tettigonia comes = Typhlocyba id. (auct. Woodw.)

Tettigonia limbata = Oncometopia id.

Tettigonia mixta = Acocephalus id.
Tettigonia mollipes = Diedrocephala id.
Tettigonia obliqua = Typhlocyba id. (auct. Woodw.)
* Tettigonia occatoria.
Dr. Stål does not change this combined name in his HEMIP. MEXICANA.
Tettigonia octolineata = Gypona id.
Tettigonia 4-vittata = Diedrocephala coccinea Forst.
Tettigonia trifasciata = Typhlocyba id. (auct. Woodw.)
* Tettigonia versuta = Diedrocephala id. (auct. Woodw.)

DESCRIBED BY FITCH:

Acocephalus vitellinus=Selenocephalus id (auct. Ashmead).
Amblycephalus curtisii = Athysanus id.
Amblycephalus melsheimeri = Deltocephalus id.
Amblycephalus sayi = Deltocephalus id.
*Aphrophora signoreti.
Doubtless correct.
Athysanus abietis=Bythoscopus variabilis Fh. ♂.
*Athysanus fagi.
Certainly a species of *Bythoscopus*.
Athysanus fenestratus=Bythoscopus id.
Athysanus minor=Bythoscopus id.
Athysanus nigrinasi = Bythoscopus id.
Athysanus variabilis = Bythoscopus id.
Aulacizes novaeboracensis=Diedrocephala id.
Bythoscopus strobi=Phlepsius id.
Bythoscopus tergatus=Grypotes id. (auct. Uhler).
Bythoscopus unicolor=Grypotes id. (auct. Uhler).
Cicada robertsoni = Cicada dorsata Say. (auct. Woodw.)
Cixius impunctatus=Myndus id.
Delphax arvensis=Liburnia id.
Delphax dorsalis = Stenocranus id.
*Empoa coccinea = Typhlocyba id. (auct. Woodw.)
Empoa querci = Typhlocyba id. (auct. Woodw.)
Erythroneura affinis=Typhlocyba id. (auct. Woodw.)
Erythroneura tricincta=Typhlocyba id. (auct. Woodw.)
Erythroneura vitifex=Typhlocyba id. (auct. Woodw.)
Erythroneura vulnerata=Typhlocyba id. (auct. Woodw.)
Jassus fulvidorsum=Phlepsius id.
Lepyronia saratogensis=Aphrophora id.
*Monecphora ignipecta=var. of Monecphora bicincta Say.
Poeciloptera vulgaris=Lamenia id.
Smilia auriculata=Archasia galeata Fab.
Smilea castaneae =Atymna inornata Say ♂ (?).
(See under *Telamona unicolor*)
Smilia querci=Atymna id.
Telamona fagi = Heliria scalaris Fairm.
Telamona querci=Telamona monticola Fab.
Telamona tristis = Telamona coryli Fh. ♀.

These forms I have taken *in coitu*. I have never met with a ♂ *tristis* nor a ♀ *coryli*.

Telamona unicolor=Telamona fasciata Fitch. ♀ (?).

These forms always occur together and of the large number I have examined the former are always females and the latter males. On the strength of this I have placed them as a single species and am confident that future observations will justify me in so doing. The case is the same with *Smilia castaneae* Fitch. and *Membracis inornata* Say.[1]

Tragopa dorsalis=Acutalis id.

Uroxiphus caryæ=Microcentrus id.

DESCRIBED BY HARRIS:

Cicada canicularis=var. of Cicada tibicen Linn. (auct. Woodw.)

Membracis ampelopsidis=Telamona id.

Membracis univittata=Thelia id.

Tettigonia vitis = Typhlocyba id. (auct. Woodw.)

Tettigonia rosæ = Typhlocyba id. (auct. Woodw.)

Tettigonia fabæ = Typhlocyba id. (auct. Woodw.)

The *Centrotus acuminatus* of Fabricius has been placed by Say, Harris and others as the ♀ of his *Membracis bimaculata*. I have however both sexes of both of these species; the females scarcely differ from the males in form. Our described species of this genus are:

Thelia bimaculata Fab.
uhleri Stål.
*turriculata Emmons.
crataegi Fitch.
univittata Harr.
acuminata Fab.

Carynota Fitch. Dr. Stål is mistaken in placing this genus as a synonym of *Ophiderma* Fairm. It is quite widely separated from that genus but is very near his *Optilete* of which *Thelia porphyrea* Fairm., a species unknown to me, is the type. It is possible that Stål was unacquainted with the *Membracis mera* Say, which is properly the type of Fitch's genus, and hence was deceived by Dr. Fitch's erroneous reference of *Membracis arquata* Say to his *Carynota*.

[1] The following is the correct synonymy of this genus so far as I can make out:

Telamona reclivata Fitch.
monticola Fab.
querci Fitch.
ampelopsidis Harr.
cissi Harr. (List.)
cyrtops Fairm.
concava Fitch.
ornata Emmons.
coryli Fitch ♂.
tristis Fitch ♀.
fasciata Fitch ♂.
unicolor Fitch ♀.
*mexicana Stål.
*excelsa Fairm.
*pyramidata Uhler.

A NEW CECIDOMYIID INFESTING BOX-ELDER (*Negundo aceroides*).[1]

BY C. P. GILLETTE, AMES, IOWA.

CECIDOMYIA NEGUNDINIS n. sp.

Galls. — The galls (G) are produced from terminal buds on all parts of the tree. Each is made up of a number of transformed leaves and petioles arranged in pairs in which the two leaves are opposite. They are subglobular in outline and vary from less than one half of an inch to nearly an inch in diameter. The outer basal portion of the gall is formed by an enormous enlargement of the bases of the petioles of two leaves which unite and form a receptacle like the cup of an acorn holding the inner portions of the gall. In the central part of the gall, the leaf blades may be entirely involved or their tips may be partially expanded.

Gall-flies.—Females, dry specimens. *Eyes* large, coal black and coarsely granulated; *antennae* one-half the length of the insect, 13-jointed, first joint globular, remaining joints cylindrical, second and third joints contracted in the middle, pedicels of joints short, about one-quarter the length of the joints, all of the joints moderately set with hairs the longest of which nearly equals the joints in length. *Thorax* very dark brown, opaque, and naked except two rows of long gray hairs in longitudinal grooves running from collar to scutellum and similar hairs at the sides of the thorax; scutellum of the same color as the mesothorax and with a few long gray hairs. Beneath the wings it is yellowish. *Dorsum* dark brown, sides of *abdomen* and venter light yellow; abdomen sparsely set with gray hairs above and below. *Ovipositor* yellowish brown and in specimens taken while ovipositing, it is exserted one

CECIDOMYIA NEGUNDINIS n. sp.
Adult female, O, avipositor, E, eggs, G, gall. Fly and eggs greatly enlarged. gall slightly enlarged. *Original.*

[1] Read before the Iowa academy of science, 5 September 1890.

and one-half times the length of the insect. *Legs* rather pale, tibiae and tarsi infuscate, rather densely set with silvery hairs. *Wings* beautifully iridescent and rather sparsely set with long gray pubescence, fringed all the way around; costal and first longitudinal nervures rather heavy and united at the apex of the wing as one continuous vein. The little cross vein between the first and second transverse nervures and the outer or upper branch of the fork in the third transverse nervure are almost obsolete and scarcely visible except in favorable light. Length of dry specimens one and one-half mm. Length of fresh specimens two mm.

The eggs (E) are a bright orange color, .4 mm. in length and much elongate. Some are straight, others are variously bent and all are pointed at one end and often with a short pedicel attached.

This insect is decidedly an injurious species. Trees upon the College campus that were the most severely attacked by this fly the past summer have had not more than half of their normal amount of foliage this year.

On the 18th of April, last, the writer noticed the flies abundant among the branches of the trees and the process of egg-laying was carefully watched with a hand lens. The females were so intent in their duties for the propagation of the species that they were not easily disturbed. They do not pierce the bud scales but work their long slender ovipositors far down between the scales and there deposit a large nest of eggs, sometimes forty or more in a place. By separating the scales the clusters of eggs can be plainly seen with the naked eye. The irritation set up by these eggs and the maggots that hatch from them aided, perhaps, by a poisonous secretion from the mother insect causes the abnormal development of the part. The galls all die a few weeks later when the maggots leave them. These dead galls turn black and remain upon the trees giving them an unsightly appearance.

PREPARATORY STAGES OF CERURA MULTISCRIPTA, RILEY.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

Egg. Slightly more than hemispherical, the base flat, dead sordid white, covered with many short dark brown hairs irregularly laid on and distributed also on the parts of the leaf adjoining. Diameter 1.3 mm. Laid in groups of five or less on the under surface of a leaf. These eggs had hatched when found, the larva having emerged from a hole in the side, leaving the rest of the shell intact.

First stage. Head subquadrate, depressed at the vertex, black and shining. Width, .6 mm. Body furnished with

minute tubercles, a spined process at each side of the cervical shield and two tail-like appendages which take the place of the anal feet. Color black throughout a little paler ventrally.

Second stage. Head rounded, minutely punctured, with a tubercle below the vertex of each lobe. Color purplish black, a little paler about the sutures of the clypeus (triangular plate). A few short hairs. Width .9 mm. The body has several rows of minute piliferous tubercles, two large, thick, heavily spinose cervicle horns on joint 2; tails, long, sharply spinose, shiny black, the extensile threads purple black, whitish at base. Body velvety purple black, the venter greenish. Length of body 4 mm., of tails 4 mm.

Third stage. Head with two tubercles before the apex of each lobe, one in the centre of and one each side of the clypeus. Color, dull black, clypeus and mouth reddish, ocelli black, antennae pale. Width 1.3 mm. Cervical horns thick, heavily spinose, the spines blunt and each tipped with a hair. About six rows of elongated piliferous tubercles on each side, alternating anteriorly and posteriorly on each segment. Tails long, heavily spinose, black, the extensile threads brown, white at base. Body and legs greenish yellow, a black dorsal band covering the cervical horns, narrowing to joint 4 where the dorsum is angularly elevated, widening to near the spiracles on joints 8 and 9, then continuing evenly over the subdorsal space to the last segment. Spiracles narrowly black ringed. Length of tails, 5 mm.

Fourth stage. Head dead purple black, greenish at the sides posteriorly, the upper half sprinkled with little yellowish dots, but leaving a line of the ground color each side of the central suture.

Clypeus and mouth, paler and shiny: antennae whitish, ocelli black. Width 2.1 mm. Body as before, considerably elevated dorsally at joint 4 with a rounded pinkish dorsal process. Cervical shield large, purplish black, the horns rather thick and short, heavily tuberculated. Body yellow-green, the dorsal stripe black as before, but a little purplish, spiracles white with a fine black border, the posterior ones more or less surrounded by black. Tails heavily spinose, black; length 7 mm. The piliferous tubercles of the body are very small, those on the lateral region white besides many small lateral white spots. A narrow yellowish stigmatal line. Two erect spiny black hairs beyond the anus.

As the stage advances, the spines on joint 2 become partly white, the dorsal band partly striated and indistinctly bordered anteriorly with white, the stigmatal line just below the spiracles is white and there is a general approach to the next stage.

Fifth stage. Head rounded, rather flat in front, shagreened. Color black, green at the sides posteriorly, a large band in front as wide as the space between the eyes at base, but narrowing to the vertex, sordid white, mo tled a little with the ground color. Labrum whitish; maxillae black; antennae

white. Width of head 3.7 mm. Cervical shield large, angulated at the corners without any horns or spines. Beneath it the head can be partly retracted. Body angularly elevated at joint 4 with a dorsal fleshy process. Tails 9 mm. long, whitish above and green below at the base, the rest purple with black spines. Extensile threads yellowish at base, then red fading to yellowish again towards the ends. Body green, a broad white dorsal band edged with white, confusedly striated on a purple ground which soon becomes green, a little purple on joints 2-4, decidedly so on the anterior corners of the cervical shield (where it shades into pinkish in the fold of skin behind the head) on the hump on joint 4 and on joint 8 subdorsally in the angle of the band. It begins broadly on joint 2 covering the cervical shield, narrows to the process on joint 4, widens to just above the spiracles on joint 8 and gradually narrows to joint 13, where the anal plate is greenish. A distinct white substigmatal line, edged below with brown and narrowly above with black, absent on joint 2 and turned up at its anterior end. Many small lateral white flecks. Spiracles, black, white centrally. Thoracic feet twice lined with black longitudingly; abdominal, once transversely, the claspers tipped with black. Length 25 mm. exclusive of the tails. The erect spines beyond the anus, whitish. When the larva has finished eating, all the white of the dorsal band except its borders fades out, leaving the back green and the cervical shield pale blue.

Cocoon. Formed on wood of gummy silk strengthened by many little pieces of bark and wood bitten off from the inside, thus forming a hollow. It is elliptical, just large enough to contain the larva and becomes very hard, closely resembling a lump or excresence on the bark.

Pupa. Cylindrical, tapering a little towards both ends, the last two abdominal segments rounded and appressed, the others capable of motion; no cremaster. Eyes prominent; a narrow carinated ridge runs along the head from between the eyes to the back of the place of origin of the antennae. Cases creased and very minutely punctured, not shiny; eyes and body sublustrous, the latter minutely granulated at the anterior half of each abdominal segment; spiracles distinct. Color dark reddish brown, with a blackish shade over the dorsum. Length 18 mm., greatest width 6.5 mm. Pupation occurs in about two weeks after the completion of the cocoon and the insects remain in this stage throughout the winter.

Food plants. Willow (*Salix*), Poplar (*Populus*). Larvae from Dutchess Co., N. Y.

NOTES ON THE EARLY STAGES OF TWO SPHINGIDAE.

BY ALPHEUS SPRING PACKARD, PROVIDENCE, R. I.

It is evident that what little we know, notwithstanding all the effort which has been made, of the life-histories of our *sphingidae*, will have to be done over again in a more thorough and systematic way, while each stage should be very fully and comparatively described, in order to ascertain the probable relative age both of the species of the genus, and of the genera themselves. In this way we shall be able to arrive at a probable phylogeny of the sphingid family; i. e., we may discover the ancestral forms, i.e., those which have through adaptation survived many ages, and the later, more highly modified species, which are the result of adaptation to newer, changed conditions. One may feel sure that in this attractive labor, he will derive great intellectual benefit and stimulus. It will not only cultivate his powers of observation, but add to habits of reflection, and draw out whatever latent philosophical capacities or tastes may have laid dormant in his nature. In such work Weismann's beautiful "Studies in the Theory of Descent" will be the student's guide, and it is greatly to be desired that our younger lepidopterists should obtain that work and make a careful study of it. From our limited experience in rearing only two or three sphingids, and a number of bombyces, we feel confident that the facts and theories in that stimulating work are as a rule well founded; and we are glad to acknowledge our great indebtedness to the learned and thoughtful author. As the work is well translated by Prof. Meldola, and can be had at a very moderate price, far less than the original cost, there is little excuse for not buying it.

Thus far we have perhaps not a single thorough and well illustrated life-history of any of this group, and we are still in much the same condition that they were in Europe, before the publication of Weismann's work. This is not written to depreciate in any way the excellent and honest work which has been done by Messrs. Lintner, Riley, Hulst and others. What we mean to say is that the life-histories thus far published, have not been worked out with reference to the origin of the markings, the lines, stripes and spots; nor with reference to the probable relative ages of the species, nor to the position in nature of the different genera, so as to enable us to determine which are the older or simpler forms, and which the more recent, more modified genera, or species. The work can hardly be done by one person, or in even several seasons, but should a few coöperate, a great deal of desirable work could be in the course of a few years performed.

The few notes below were made during the past summer on two forms allied to those interesting genera *Deilephila*

and *Thyreus*, as well as *Philampelus* and *Chaerocampa*. I had no intention of doing any work in this family, and the notes are not intended to be at all final, but imperfect as they are, they show how interesting it would be to know something of the early larval stages of the American species of *Amphion*, *Thyreus*, *Enyo*, *Deilephila*, *Philampelus*, and certain tropical forms, to which the genera in question are allied.

Life-history of Deidamia inscriptum. (*Harris.*)

Mr. James Angus, of West Farm, N. Y. had the goodness to send me the eggs of this sphingid, which is allied to *Thyreus abbotii*, and I was able to carry it through its stages, while in Brunswick, Maine. As the climate is much cooler there than in New York, the nights especially being much lower in temperature, the length of the different stages will probably be found to be much greater than in New York, The larva, according to Mr. H. Edwards's very useful Bibliographical catalogue of the described transformations of North American lepidoptera, has been briefly described by Strecker (Rhopal. et Heteroc.; 112) and by Fernald (Sphingidae New England, 70,) but the early stages have not yet been described. The description of the larva in Strecker's work was however given him by Mr. John Akhurst, from memory, and Prof. Fernald's description is simply copied from Strecker. According to Akhurst the larva is "full-grown about the last of June or beginning of July, and is single-brooded, the perfect insect appearing about the middle of May. Several moths issued in Providence the end of May and early in June from pupae kindly given me by Mr. Angus, but though several males and females were placed within the mating bag no fertilized eggs were obtained. The eggs from which my larvae were bred were received from Mr. Angus, 24 June 1890.

Egg.—Rounded oval, rounded alike at each end, somewhat longer than broad, length 2 mm.; greenish in color. The shell is thin, smooth when examined under a Tolles triplet of high power, and also under a ½ inch Tolles objective, but with the latter, scattered roughnesses are perceivable, though not forming true granulations.

Stage I.—Just hatched on the morning of 27 June. Length 3½ to 4 mm. Head rather larger, wider than the body, which tapers somewhat from the prothoracic segment to the end. It is uniformly smooth, pale yellowish green, the head being exactly the same color as the body. There are on the body no spots or markings of any kind. The body is provided with long slender sparse, grandular, slightly bulbous hairs, about one-third as long as the diameter of the body, which arise from small minute conical warts. The hairs on the head taper to a fine point.

The very slender, filamental "caudal horn" is, if anything, slightly longer than the body; it is held erect, perpendicularly to the body, and is shining black and very hairy, the hairs being

short and fine, those in the middle of the horn not being one half as long as the diameter of the appendage. The horn is very slightly divided at the end into two tubercles, each bearing a bristle.

30 June, having fed for two or three days they are now larger than before, being 6 to 7 mm. in length, and now the head is no wider than the body, the latter having after two or three days' consumption of food filled out, so that the body does not taper so much toward the end. There are as yet no spots or stripes on the body. The piliferous warts are present, the four dorsal ones being arranged in a trapezoid; they are faintly marked, and green in color.

At the end of stage I, about 3-4 July the body had grown so that the caudal horn was scarcely two-thirds as long as the body, when 6 to 7 mm. in length. There are now, just before ecdysis, faint traces of a diffuse yellowish line, which is seen more distinctly in stage II, and the granulations on the skin are more distinct than when the larva was first hatched.

Stage II.—4-5 July. Length 10 mm. The head is now about as wide as the body, not quite so wide as where the body is thickest, *i.e.*—at the first abdominal segment. The caudal horn is now only half as long as the body, and is black and hirsute. It is distinctly divided at the end, each lobe bearing a seta as long as the horn at the end is thick. About eight rows of granulations cross each segment, and there is now a faint greenish-yellow lateral line: but no traces of the oblique lateral stripes can be seen until at the end of the stage. The hairs now have lost their bulbous shape, and taper somewhat to the end. It usually rests on the midrib of the under side of the leaf in this and the preceding stage.

Stage III.— 9-11 July. Length 20 mm. The head is now proportionately small, narrower than the rather thick body, which is a little swollen on the 3rd thoracic and 1st abdominal segments. The caudal horn is only as long as the body is thick; it is black, becoming pale at the tip, and green on each side at the base. There are eight wrinkles across the back of the basal abdominal segments.

There is a very narrow dorsal dark green thread-like line, and a much wider diffuse subdorsal line, the two meeting at the base of the caudal horn; below is a whitish green lateral line also ending on the base of the caudal horn. The oblique lines are yellowish, and much more distinct than at the close of the preceding stage; the bars only extend from the hinder end downward to the front edge of the same segment, not extending upon the next segment. The spiracles are green, not ringed, but bearing two obliquely vertical parallel twin oblong fine black dots. The wrinkles are well marked on the dorsal surface; lower down the sides they break up into raised white spots or granulations. The suranal plate is faintly edged with yellowish.

Stage IV.—Moulted 14 July. Length 25 to 30 mm. The head is pea-green,

with a yellowish stripe on each side, continuous with the subdorsal stripe along the body, which is now broad and diffuse, with a dark green shade above it. The lateral yellowish stripes as before. The horn is a little shorter than in the preceding stage, and the green at the base on each side encroaches more on the black, extending higher, while the extremity of the horn is tipped with green, in one specimen distinctly so. There are eight transverse wrinkles to each segment, and the white granulations are more distinct than before. The spiracles are white, with two twin vertical elliptical spots on each side nearly meeting in the middle.

In this stage when disturbed the caterpillar will turn the head, and the front part of the body, represented by the three thoracic segments, over upon the back of the abdominal region so that the feet are held up vertically, as in Datana and other larvae.

Stage V.—Last stage, moulted, 21-22 July. Length 54-55 mm. The head is as in the previous stage, but rather more angular on the sides. The lateral yellowish line on the head is very distinct and continued as distinctly on the thoracic segments as far as the middle of the 3rd thoracic segment; beyond this the line is indistinct on the three following segments, becoming distinct again behind the middle of the body.

The prothoracic segment is a little wider than the head, and about one-half as wide as the 3d thoracic segment. The lateral yellowish stripes are distinct, not reaching either the front or hinder end of the segments. The caudal horn is now yellowish; the subdorsal yellowish lines ending on it; it is about one-half as long as the 8th segment is wide when seen from above, and is finely tuberculated with dull amber-colored warts. The upper side of the body is yellowish-green, but the under side is almost exactly of the hue of the under side of the leaf of Ampelopsis, being of a rich soft pea-green and less distinctly and prominently papillated than above. The thoracic legs are yellowish-green.

27 or 28 July it began to contract in length in preparation for pupation, and it assumed the pupa state 30 July.

Duration of stage I, about 7 days; of stage II, 5 to 6 days; of stage III, 3 to 6 days; of stage IV, 6 to 7 days; of stage V and last, about 6 days; of the prepupal stage from 2 to 3 days. Total duration of larval life, about 33 days.

Summary of the most important changes.

1. The glandular bulbous body-hairs disappear after stage I.

2. The caudal horn is at the time of hatching slightly longer than the body.

3. Faint traces of the yellowish lateral line appear at the close of stage I, but no oblique stripes.

4. Traces of the oblique yellow stripes appear at the end of stage II.

5. In stage III the body begins to be swollen on the three thoracic and the 1st abdominal segments. All the distinc-

tive lines and markings of the last stage are now indicated. It is also probably the rule among the bombyces, judging by many cases I have observed, that by the 3d stage the larva now large and living more conspicuously, assumes the general shape and coloration of the fully fed caterpillar.

The life-history of Ampelophaga myron (*Cramer*).

Two of the larval stages have been described by Lintner (Proc. Ent. Soc. Phil. v. 3) the length of his youngest larva being .50 inch; the other stage being the final one. Riley (2d Missouri Rept. 71-73) has briefly described the egg, the first and last stages. I am also indebted to Mr. James Angus for the eggs of this sphingid which were sent from New York at the end of June. The larvae were hatched 2 July 1890, and fed on Ampelopsis leaves.

Egg. — Rounded oval. Length 2½ mm. The shell, under a Tolles triplet is smooth. It is of the same shape, size and appearance as that of *Deidamia inscripta.*

Stage I.— Hatched 2 July. Length 5 mm. The larva in this stage, especially at the time of hatching is not only seen to be similar to that of *Deidamia inscripta*, but is under a high power Tolles lens not even distinguishable from it, unless the caudal horn be slightly shorter and less hirsute in the present species. The head is at first larger and broader than the body, and of the same color. Prothoracic segment with a dorsal crescentic shield or flat surface. The caudal horn is long, black and when observed under a high power Tolles triplet, hirsute. The legs are concolorous with the body. Behind the base of the caudal horn both in this and *D. inscripta*, is a deep orange-red discoloration or transverse streak. The body is now wrinkled transversely above. The hairs are glandular, and slightly bulbous at the end.

Three days later, after feeding, and compared with larvae of *D. inscripta* of the same period the body seems to be in *A. myron* a little slenderer, and it also differs in the sutures being slightly yellowish, while the head is of a paler greenish tint. The glandular hairs are of about the same length as those of *D. inscripta*, but perhaps the tubercles are more prominent.

Stage II.—Moulted 9 July. At first the caudal horn is flesh-colored, afterwards turning dark. By 11 July it had grown to the length of 10 mm. And now the caterpillar is quite different from that of *D. inscripta* of the same stage. The body is very slender, the head slightly wider than the body. Each segment has eight wrinkles or folds of the skin which is also spotted with white raised dots. The sutures are yellowish green, contrasting with the body. The caudal horn is pale reddish-chestnut, becoming darker at the extreme tip, which is slightly but distinctly divided at the end, each lobe bearing a bristle. There are as yet no lines or oblique stripes visible.

Stage III? Length 17 mm. 18 July, it had probably moulted, but I did not see

it in the act. The head is as wide as the prothoracic and middle body-segments; the 3d thoracic and 1st abdominal segments are by this time somewhat swollen. A distinct narrow white lateral line is now present, while the dorsal region between the two lines is paler than on the sides of the body. The head is now rough with small pointed tubercles. There are no lateral oblique stripes present. The caudal horn is reddish flesh-colored, becoming darker at the tip.

Stage IV. Length 25 mm. Moulted 24 July. This I suppose to be the third moult. The head is long, somewhat lengthened towards the vertex, and slightly flattened on the sides; the surface is unequally tuberculated with sharp conical white tubercles arranged in irregular longitudinal lines. There is along each side of the head a broad, yellowish lateral stripe, and a faint yellowish shade along each side of the median suture. The yellowish line on the side of the head is continued on the body as a subdorsal whitish line, which is faint on the prothoracic segment; this line behind the middle of the 3d thoracic is formed of a row of rather large conical tubercles, it again becomes continuously white on the 7th and 8th abdominal segments, fading out at the base of the caudal horn, which is whitish, with sharp, slender black tubercles on the upper and under side of the horn, the tubercles on the sides being white; the tip of the horn is flesh-colored, and the entire horn is nearly twice as long as the body is thick. The spiracles are raw-sienna brown, with a white spot at each end of the respiratory slit above and below. The thoracic legs are peculiarly spotted with black on the green base, and are reddish cherry at the ends. All the abdominal legs are greenish. The body is thickest on the 3d thoracic and 1st abdominal segment. On the 2d thoracic to the 5th abdominal segment are faint oblique lateral whitish stripes, bearing white obliquely-arranged white tubercles, those on the first three abdominal segments more distinctly underlined by white. It died 5 Aug., when nearly full-fed.

NOTE ON TWO SPECIES OF DATANA.—From my remarks after the two species of Datana which I described, (Psyche, v. 5, p. 299-300,) it might be inferred that they were compared with a number of allied species. I would like therefore to state that *Datana modesta* was compared with the type of *D. floridana* in the collection of Mr. Edward L. Graef, and that *D. palmii* was compared with a type of *D. integerrima* G. & R., in the collection of the late Coleman T. Robinson, now in the American museum of natural history, N. Y.

William Beutenmüller.

EDWARDS'S BIBLIOGRAPHY OF TRANSFORMATIONS.—It will be strange if an impetus is not given to the study of the earlier stages of lepidoptera in this country by the bibliograhy of the literature of the subject, prac-

tically complete, which Mr. Henry Edwards[1] has recently published. Of course, in the nature of things, it is a simple compilation; but since our actual knowledge of the perfect insects in the lepidoptera is out of all relation to our knowledge of their earlier conditions and their life histories, every contribution which tends to lessen the disparity is a distinct gain. We therefore particularly welcome the present work as one likely to have a marked influence in that direction especially if followed up, as the author promises, by annual appendices.

The insects concerned are systematically arranged, following the lists of Edwards, Grote, Fernald and others; under each species the recorded transformations, whether given in description or figure are arranged (generally in a single line) chronologically, a form of exposition which has a definite value as showing in so many cases the advance of our knowledge and the sources of borrowed material; finally the food-plants are given, not always so fully or specifically as might have been done. Short descriptive words such as "condensed" or "quotes French" etc. often characterize a reference briefly to indicate its value, and we think a more liberal use of comments in this brief form would have added much to the usefulness of the catalogue, and would have required little more work if undertaken from the outset. The labor of such a bibliography, however, necessitating exactitude at every step can be appreciated only by those who have tried it; and the last straw may sometimes break the poor camel's back. Nearly nineteen hundred species are indexed, and sixty-five authors cited.

As our knowledge of the lepidoptera of North America may almost be said to have originated in the famous folios of Abbot and Smith which a century ago recorded and pictured the transformations of so many species, many indeed hardly ever bred since then, it is not surprising that the earlier stages of lepidoptera should always have had their devotees in this country, and that, all things considered, our country is as well known in this respect as we could expect. That, however, a wealth of material lies untouched at our very doors the pitifully meagre entries which have often to be made in this bibliography bear abundant proof, while a comparison of this list with those of the known species should make us rather ashamed than proud of the record which Mr. Edwards holds up before us. We commend this book to the American lepidopterist as the most important work of reference he can have in his library.

[1] Bibliographical catalogue of the described transformations of North American lepidoptera. By Henry Edwards. Bull. U. S. Nat. Mus., No. 35. 8vo. Washington, 1889, pp. 147.

Do Flies Migrate?—Some years ago, early in September, I saw a migration of butterflies, *Anosia plexippus*, at Little Boar's Head, N. H., which I have recorded in my Butterflies of the Eastern U. S., v. 1, 730. They were moving southward along the shore. One afternoon at the end of last July, July 27 to be exact, I was sitting on the shore itself, backed by a bank, within gunshot of the same spot at which I had seen the flight of *Anosia*, when my attention was directed to the constant southward movement of small flies. There was practically no wind, but the flies moved swiftly in one direction for the space of two hours, forming a stream such as might readily pass through an open barrel; their numbers varied; at times but 3 or 4 would pass a given point every second; at other times hundreds; but on the average they were as many in the given area as drops of rain in a smart shower; rarely one would be seen moving out of the stream, and then it was in a diametrically opposite direction, and just as swiftly. I should add that the direction was evidently influenced in part by the trend of the low bluff at the base of which I was sitting, and I did not go elsewhere to observe them. The stream was not more

than three feet distant and only a few inches above the ground. The flies appeared to belong to a single species as several were caught for identification, and prove to be a species of *Ilythea*, one of the *ephydridae*, and probably the European species *I. spilota*, as that is the only one recorded from this country. I shall be glad to know if such streams have before been observed among *ephydridae*.

Samuel H. Scudder.

THE SUPPOSED BOT-FLY PARASITE OF THE BOX-TURTLE.—During the autumn of 1889 Mr. W. H. Ellsworth donated to the Milwaukee Public Museum a pair of box-turtles (*Cistudo carolina*), which were taken near Windsor, Ct. They were kept alive during the winter in a terrarium, but the female died 5 April 1890. My friend, the talented taxidermist, Mr. C. E. Akeley, while skeletonizing this specimen called my attention to a peculiar swelling in the animal's neck. Closer examination showed that the cutis close to the carapace and a little to the right of the median dorsal line, had been converted into a pocket about ½ of an inch in diameter. This pocket opened on the surface by means of a very small aperture and contained besides a quantity of suppurative matter, eight maggots which I at first took to be bot-fly larvae. Both their shapes and positions with reference to the inner surface of the cavity which they had excavated reminded me of the *Gastrophilus* larvae so often exhibited in the shops of veterinary surgeons. Such of the larvae as had not been injured during the removal of the skin and flesh from the cervical vertebrae of the turtle, buried themselves in the earth 14-15 April and pupated. The imagines made their appearance 27 May and proved to be not bot-flies at all, but a species of *Sarcophaga*.

Prof. S. W. Williston has directed my attention to the following note by Packard (American naturalist, 1882, v. 16, p. 598):

"The museum of Brown University has received specimens of a bot-fly maggot, of which eight or ten were taken, according to Prof. J. W. P. Jenks, from under the skin of the back of the neck, close to the shell of the box-turtle (*Cistudo carolina*). The turtle was collected at Middleboro, Mass." * * * *

"It appears to be a genuine bot-fly, but quite unlike any genus figured by Brauer in his work on the *oestridae*.

The body is long and slender, cylindrical, tapering so that each end is much alike. The segments are provided with numerous fine spines, which are not entirely confined to the posterior half or two thirds of the segment. The body is slender and the spines much smaller than in *Gastrophilus equi*."

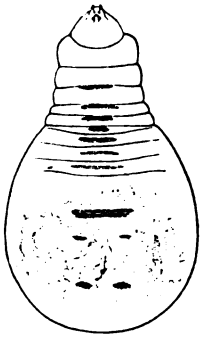
A comparison of this account with my observation given above leaves no doubt that the larvae seen by Packard and myself are specifically identical. I have also compared one of the maggots with Packard's figure and description and can detect no differences. The error into which he has fallen is pardonable, inasmuch as the *Sarcophaga* larvae are microscopically so similar to bot-fly maggots that any entomologist unaccustomed to the minute study of dipterous larvae would not hesitate to allocate them to the *oestridae*. Until the flies appeared, I was quite sure that I had found a bot-fly infesting a reptile. (See Proc. acad. nat. sci. Phil., 1887, p. 393-394; 1888, p. 128; Science, 5 December 1884, v. 4, p. 511.)

It would seem to be a regular habit with this fly to infest *Cistudo carolina*. That the eggs or young larvae are laid on the living turtle there can be no doubt, but whether they are deposited in a sore, or on the unabraded skin of the nucha, as being a region inaccessible to the turtle's beak and claws, remains to be seen.

The four imagines which I succeeded in rearing proved to be females and though the species appears not to have been described as yet, I would rather wait till male specimens can be secured, before attempting to add another member to the large and very difficult genus *Sarcophaga*.

W. M. Wheeler.

AN INTERNAL DIPTEROUS PARASITE OF SPIDERS.—In the spring of 1887 while hunting for spiders in company with Mr. G. Dimmock in the cracks on the steep sides of some rocks near Roberts Station in Waltham, Mass. I found hanging in cobwebs several soft white maggots and pupae. The webs were generally old and out of repair and a closer examination showed that there were no living spiders in them but in almost every one an empty skin of a common spider, *Amaurobius sylvestris*, nearly full grown. The skin of the legs and thorax was not clean like a moulted skin but dirty and opaque as though eaten out and the skin of the abdomen when present was torn and shrivelled. From this I concluded that the maggots came out of the spider and from their size must have nearly filled them. The maggots varied considerably in size the largest being a quarter of an inch long while others were not much more than half as large. The hinder half of the body was thicker than the front half and nearly spherical.



They hung head upward holding to the web by their jaws and were also partly supported by threads under and around them. I was unable that season to raise the adult fly some of the larvae being injured in carrying them home though kept in cobwebs and cotton wool and the others dying apparently from too dry air within a few days. In May 1889, I again found in the same locality several other specimens also in abandoned cobwebs and with the dead and empty spiders as before and among them one pupa far enough advanced to grow to the adult condition though the skin dried so much that it had to be torn off and the fly never expanded its wings properly. It turned out

to be a species of *Acrocera* belonging to a family several species of which have been found parasitic in the same way in spiders. In his monograph of the spiders of Prussia (Schriften der Nat. Gessel. Danzig 1863-1866) Menge mentions a similar case. He kept in the house a female *Clubiona putris* in its nest attached to a heath plant. After a few days the spider died and shrivelled and in its place was a maggot suspended by a thin web across the nest. Next day it pupated and a week later there came out the fly. *Henops marginatus* Meigen.

F. Brauer (Verb. d. Zool-bot.-gessel. Wien, 1869, p. 737) describes *Astomella lindenii* Er., which came from *Cteniza ariana* Koch, a trap-door spider from Corfu. The pupa and larva skins were found in the tube and also the dead spider with the abdomen shrunken and having in front a large hole from which the maggots had escaped.

Both these flies belong to the *acroceridae*. My specimen has been examined by S. W. Williston who thinks it is either *Acrocera fusciata* or a species closely related to it.

J. H. Emerton.

ENTOMOLOGICAL NOTES.

Dr. William Patten has been appointed professor of biology at the University of North Dakota at Grand Forks.

Dr. Clarence M. Weed, of the Ohio experiment station, has editorial charge of the department of entomology of the American naturalist.

Mr. Jerome McNeill of Moline, Ill., has been chosen professor of biology and geology at the State University of Arkansas at Fayetteville.

CORDULINA.—In a note to Dr. H. A. Hagen the Abbé Provancher writes that he has not visited Mt. Yamaska since 1877. So far as known his original specimens of *Epitheca yasmaskanensis* are the only ones extant. Mr. Lintner also writes that he has not taken *Cordulia lintneri* since his first catch.

KOLBE'S GUIDE.—Part 4 of Kolbe's German Guide to the knowledge of Insects, p. 177-224, is entirely devoted to the antennae and mouth-parts with a large number of simple but instructive and mostly original figures. This excellent work was originally announced to be completed in six or eight parts, but as the author has not yet covered more than one-sixth of the ground he laid out in his prospectus, it is more likely to continue to twenty.

GREENLAND INSECTS. — Aurivillius has begun in the Handlingar of the Swedish Academy a study of the insect fauna of Greenland, which he is undertaking with his usual thoroughness, as the first instalment, including the lepidoptera and hymenoptera, shows. It is accompanied by three plates, and several excellent figures in the text. He records 28 species of lepidoptera and 17 of hymenoptera. The most numerous genera of lepidoptera are Agrotis, 5 species, Plusia and Hadena, 4 species each. The only new species are one each of Anarta, Pimpla and Banchus.

EARLY LAST AUGUST a green cockroach of considerable size, *Panchlora nivea* (Linn.), was found alive, with a multitude of young ones just hatched, in the bath room of a house on Lafayette St., Salem, Mass., and sent to Mr. S. H. Scudder for determination by Prof. E. S. Morse. It is a native of Cuba and Central America. It is curious that Mr. Scudder has also in his collection a specimen marked as found flying in a store in Boston, 26 December, 1878, on the authority of the late Dr. Samuel Kneeland.

THE APPLE MAGGOT, *Trypeta pomonella*, is the subject of an elaborate report by Prof. F. L. Harvey of the Maine State College. The investigations were made in 1888 and 1889 chiefly at Orono, though the date and place of publication are not noted. The species is described and figured in all its stages and its life-history and habits are given in detail. As the larvae do not leave the fruit until it falls from the trees the thorough and universal destruction of windfalls is recommended as the best remedy.

LEPIDOPTERA INDICA. — Three parts of Moore's Lepidoptera Indica, including 80 pp. of letter press and 24 plates, have now appeared and the author has not yet more than half completed the *euploeinae* with which he begins his work and of which thirteen genera and thirty-five species are so far characterized; this gives a lively impression of the difference between that fauna and our own. The additions to our knowledge of the earlier stages are interesting; the caterpillars and chrysalids of seven species are given (from one to three figures of each) of as many genera, and their peculiarities certainly seem to support the closer subdivision of these Eastern *euploeinae* of which Mr. Moore has been the foremost supporter. About half of these same species have before had their earlier stages figured, but of these as well the illustrations are new; never before have the *euploeinae* been so well illustrated in their earlier life. All the figures appear to have been put upon the stone by Mr. Moore's son.

WHAT IS THE CAUSE of the gradual extermination of insects in certain places? Is it the changes incident to growth of population? It is well known that *Chrysophanus dispar* formerly found in England is now no longer known there; as the French might say, dispar has disparu. Mr. Jenner Wier writes that *Aporia crataegi* was a common species in several parts of Sussex, notably at his father's, about 8 miles from Lewes, where it was to be seen in numbers every year, but now for forty years he has seen but one specimen; nor do his Sussex friends take it. He states that it has also disappeared from the New Forest where he used to take it up to ten years ago, and from Monmouthshire, where it was once common.

THE TENTH PART of the current series of Edwards's Butterflies of North America deals with two species from the eastern half of the continent, two from the western, both of the latter species of Argynnis, of which little more than the bare description is given in the text. Of each of the eastern species, however, *Argynnis alcestis* and *Satyrodes canthus*, a full life-history is given with abundant illustration, and, of course, of the highest excellence as Mr. Edwards deals with no other. The statements regarding the difference of behavior and coloration of different caterpillars of the same species is full of interest and shows the necessity for repeated observations. The exceptional autumn activity recorded of the young caterpillar of *A. alcestis* may possibly have been due to an unwonted climate, as they were transferred while in the egg-state from Chicago to Coalburgh. While one does not like to find fault with a work of such marked excellence, it is a pity that the author cannot find a better way of describing the position of the tubercles of the caterpillar than that employed, which often reads like a multiplication table, locates them vaguely at best, and omits much that is distinctive.

LONG-LIVED ZOPHERUS.—Mr. S. H. Scudder has in his possession four specimens of *Zopherus bremii*, one of the *tenebrionidae* from Yucatan, which is used as an ornament to the dress in Central America by being belted and chained with gold; the natives call them Makatch and they are popularly supposed to live on air. They were received from Stephen Salisbury Esq. of Worcester who has had them alive for five years. They have been kept in a wire cage in which is a large piece of half decayed wood, which they evidently gnawed more or less, making some chips, but whether or not they devoured it was a matter of doubt until some birch fungi were introduced; these seemed to meet with more favor and especially one which had a partially black interior; it was soon seen that some of the chips were of a darker color, and examination showed in all, both gray and black, a remarkable uniformity in size; closer scrutiny showed them to be unquestionably faeces, all being of the same form and made up of a pressed agglomeration of vermiform series of particles. The amount however is ridiculously small, for a dozen of these beetles together would not furnish a thimble full in a year.

NOTICE OF MEETING, ASSOCIATION OF OFFICIAL ECONOMIC ENTOMOLOGISTS.

The second annual meeting of the Association of Official Economic Entomologists will be held at the university buildings, Champaign, Ill., November 11th to 15th proximo, at the same time and place as the meeting of the Association of Agricultural Colleges and Experiment Stations. The committee on Entomology of the latter association will meet at the same time.

Members expecting to attend, will confer a favor upon the officers if they will announce the fact, and will send titles of papers to be read or topics they desire discussed to the Secretary.

All are earnestly requested to be present if possible.

JOHN B. SMITH, Secretary,
New Brunswick, N. J.

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CONTENTS:

ADVERTISEMENTS 408
NOTES ON SOME APHID STRUCTURES.—*John B. Smith* 409-414
NOTES ON TWO SPECIES OF DATANA WITH DESCRIPTIONS OF THEIR LARVAL STAGES.—*Harrison G. Dyar* 414-420
THE NUMBER OF MOLTS OF LEPIDOPTEROUS LARVAE.—*Harrison G. Dyar* . 420-422
DESCRIPTIONS OF NEW WEST AFRICAN LYCAENIDAE.—*W. J. Holland* . . 423-431
SOME GENERA OF OEDIPODIDAE RESCUED FROM THE TRYXALIDAE.—*Samuel Hubbard Scudder* 431-442
LOWNE'S ANATOMY OF THE BLOW-FLY. 442
HYDROCYANIC ACID SECRETED BY POLYDESMUS VIRGINIENSIS, DRURY.—*William M. Wheeler* 442

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Bulletin Brooklyn Entomological Club, Vol. I, 1878–1879, ... $2.00

Burgess, E. Contributions to the anatomy of the milk-weed butterfly, Danais archippus. Boston, 1880. 16 p., 2 plates. 1.00

Gerstaecker, A. Gliederthiere Insekten, Arachniden, Myriopoden und Isopoden. In Baron Carl Claus von der Decken's Reisen in Ost-Afrika. Leipzig und Heidelberg. 1873. 542 p., 18 colored plates 7.00

Schwarz, E. A. The Coleoptera of Florida .50

Scudder, S. H. The earliest winged insects of America: a re-examination of the Devonian insects of New Brunswick, in the light of criticisms and of new studies of other paleozoic types. Cambridge, 1885, 8 p., 1 plate .50

Weber, F. Nomenclator entomologicus. Chilonii et Hamburgi, 1795, 171 p. . . .50

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PSYCHE.

NOTES ON SOME APHID STRUCTURES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

DURING the season of 1890, the most notable feature in New Jersey was the enormous increase in the numbers of the *aphididae*. Naturally, as complaints of injuries were received, I was compelled to pay some attention to these insects, and a Bulletin of the Station has been prepared treating of some of the more injurious forms. It is part of my creed, whenever I look at an insect, whatever its order, to see all I can, and so far as the characters are interesting, and bear at all on the philosophy of economic entomology (for I believe that economic entomology is simply the philosophic application of the facts ascertained by a technical study to the practical needs of Agriculture), I do not hesitate in presenting them in a popular way in the Bulletins of the Station. Sometimes the facts observed have, or may have a technical bearing, and as the Station Bulletins under present circumstances are hardly ranked as technical publications I prefer to present them in another form in the technical journals also.

The principal points studied were the beak and antennae. So far as the latter organs are concerned there is room for a great deal of histological work, and much more use than has been made, in systematic entomology.

Perhaps, after the examination of the heads of lepidoptera and diptera, the most prominent feature that challenges observation is in the eyes. These do not have hexagonal facets as usually described for insects, but there is a simple aggregation of quite strongly convex circular lenses, each quite distinct from all the others, externally, and each undoubtedly capable of receiving a complete image in itself. The very strong convexity of the lens makes it very probable that the insects are excessively short sighted. When the head has been macerated in potash, the framework of the eye appears as though the setting for the lenses had been punched out with a round punch. I take this to be a much more simple eye formation than that of the *tabanidae* for instance.

The antennal structure derives its interest from the imbricated or scale like markings of the surface, sometimes confined to the terminal joints only, sometimes present on all, and from the system of sensory pits or pores.

In reference to this last I have found it invariable on all the specimens of the

same species, and this ought to furnish a most important character in the separation of species. The system is alike in no two species hitherto examined by me, though this may not hold good throughout the family.

Another very important point struck me. In none of the wingless forms does the poriferous system attain the complexity found in the winged forms. From the young louse just born, to the pupa, the poriferous system remains the same, and is very similar in all the species; but when the winged form is assumed, the specific poriferous system makes its appearance. It is well to say here, that I have not examined the true sexes and can say nothing of any species in the sexually perfect condition. In all the wingless viviparous females examined, the larval poriferous system was retained, and *I conclude therefore that we have to do, really, with a true reproduction among larval forms, and that wingless viviparous females among aphididae are not mature insects in any sense of the term; but that they represent simply an arrested larval stage, which under other conditions would develop into a winged form.* The winged viviparous females are ultimate or mature forms in which both sexual elements are represented in the form of the original germ cell, which by budding, develops the embryo brought forth. It seems rather elementary, but equally necessary to explain, that the term "budding" as used in reference to this method of reproduction, is a budding of the germ cell, and not a budding from the body of the insect; but in this latter sense I find that the term is quite generally understood.

With these, preliminary, observations and conclusions, I will proceed to details.

In all the aphides examined the first or basal joint is subglobose, stout and short; the second is also short, but scarcely globose; the third is the first of the long joints and it is longer than either the 4th or 5th, which are subequal in length, and sometimes is as long as both together. The sixth, or terminal, is what I have termed the whip joint. It enlarges gradually from the base for a short distance and is then rather abruptly narrowed from one side, giving a false appearance of segmentation. From this point it continues to the tip, gradually tapering to a point. It is flexible, and the resemblance to a whip is not fanciful.

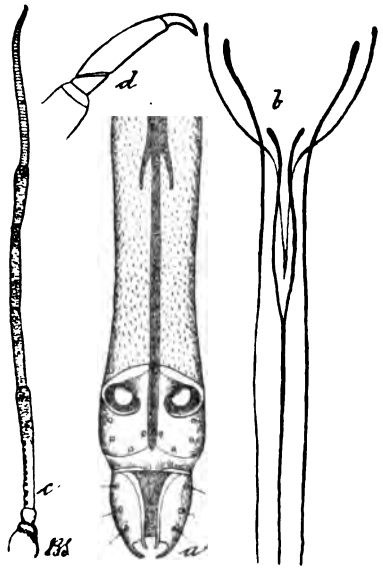

FIG. 1.

In the Wheat louse, *Siphonophora avenae* Fabr., the third joint is visibly imbricated only beyond the middle while all the following joints are obviously imbricated. The sensory pits are confined to a single row of eleven, extending from the base to beyond the middle of the joint. The 4th joint has no sensory pits and the 5th has a small group near its tip, only. The 6th joint has at the point of greatest dilation, and just before the sudden narrowing, a very distinct group of pits, and these are permanent in all stages, and very similar in all species. The absence of these would be a matter of very high systematic value.

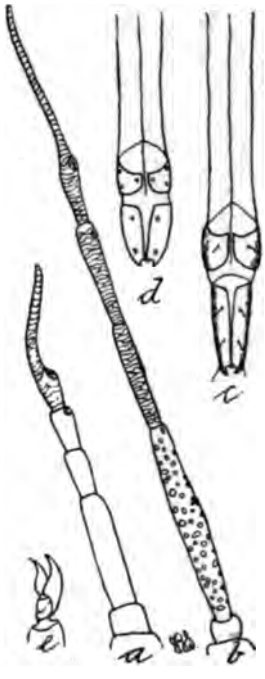

FIG. 2.

In the Cabbage louse, *Aphis brassicae* Linn., the poriferous system is entirely different. The 3rd joint is not, or but faintly imbricated, while the small, sensory pits are scattered all over the surface in no regular series and too numerous to count. In a case like this I should expect a considerable range of variation in the number of pits. The 4th joint is imbricated, as are all the following, but has no sensory pits. The 5th joint is very like that of *S. avenae*, as is also the 6th. In the immature forms the 5th joint is furnished with a single large pit at tip, and the usual small aggregation on joint 6.

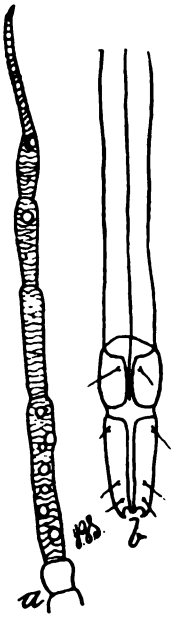

FIG. 3.

Aphis cucumeris Forbes, the Melon louse shows a somewhat di ent type

of structure. All except the basal small joints are distinctly imbricated, and the sensory pits are very much larger than in either of the preceding species. In this species the structure of the pits becomes more evident, but will not be further referred to here, as the Peach aphis affords a more satisfactory subject. The 3rd joint in this species has seven or eight rather irregularly placed pits, extending the full length of the joint. Joint 4 is free while 5 has a single large pit near the tip. Joint 6 has the usual little aggregation, one large pit, margined by several small ones.

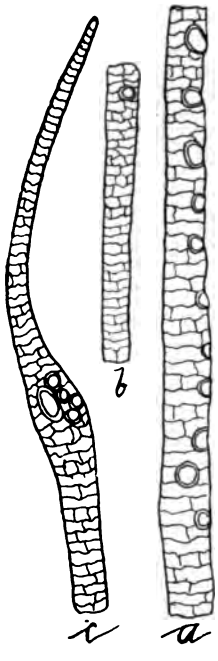

FIG. 4.

In the Cherry aphis, *Myzus cerasi* Fabr., the pores or pits are still larger, and the structure of the pits is still better brought out. On the 3rd joint, which with all subsequent ones is imbricated, there is a series of eleven very large pits in a single line: the fourth joint is free of such pits: the 5th joint has a single large pit near the tip, and the sixth joint as usual has a small group, consisting here of a very large oval pit with four smaller ones grouped at one side.

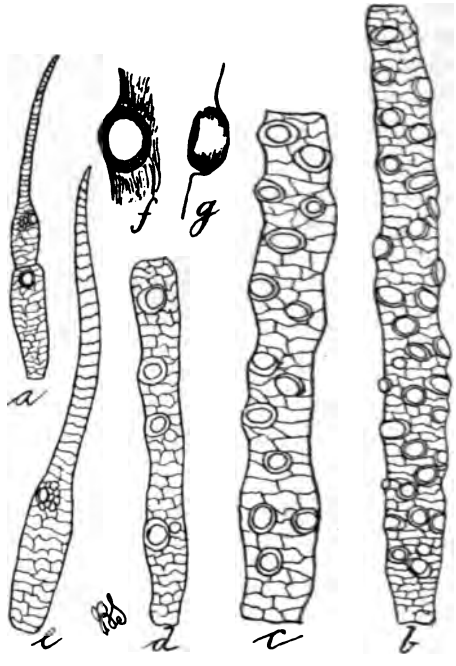

FIG. 5.

Most interesting of all, is the Peach aphid, *Aphis persicae-niger* E. F. Smith. In this species the poriforous

or sensory system attains its most complete development, so far as my observations extend. Every joint, except the small basal knobs, is imbricated, and each is furnished with sensory pits or pores. The third joint is irregular and knobby from the projecting margins of the pits, which are numerous and very large. The figure shows the appearance well, but it must be said that the enlargement of *b*, is only ⅔ that of *a*, *c*, *d*, and *e*, so that it is really equal to the two following joints in length. Joint four has also a large number of pits, irregularly scattered on all sides, and this is the more remarkable since in none of the other species is it pitted at all. Joint five has four large and two small pits on one side—other not examined—, more also than in the other species. On joint six, on the contrary, the aggregation of pits is smaller than in the Cherry aphid, though the number of small pits is greater. Curiously enough, nothing in the larval antennae indicates this extreme development in the mature form. *All* of the wingless forms have this simple, single pit near the tip of 5, and the usual small group on 6. It has been already indicated that in this species the structure is best made out. This is due to the fact that every part is more thoroughly chitinized than in any other species save *M. cerasi*, and the action of potash and carbolic acid is not so destructive, while the parts are sufficiently cleared for study. We see here that we do not have simple pits to deal with; but rather special sense organs, apparently not directly communicating with the outer air, for on careful examination a fine, tense membrane is seen to close the opening, not from edge to edge, but as if drawn over a projecting rim. It is on a side view that we best get an idea of the structure which is fairly well shown at *f* and *g*. What are the functions of these pits? Not tactile, surely! Olfactory? Why should that require any tense membrane? Auditory? Here the membrane might serve as a drum to catch the vibrations; but why should there be such a difference in number? Why also do the darker, more chitinized forms have these pits relatively so much larger? These questions are easily asked; but I shall not try to answer them.

Besides the antennae I also studied the mouth parts of these insects and find that there is some small difference in the structure here, shown in the figures given; but scarcely worthy of note, except in the case of the wheat louse. In this species the beak is perhaps shorter and broader than in the others, while the ante-apical segment has on each side a peculiar flap, gouged from the body of the joint and covering loosely the pit thus caused. This is found in all stages of this species, and nothing like it has been found in any other examined by me.

Within this beak are the four bristles, two of them connate except at base, which are supposed to represent the maxillae and mandibles, the beak itself being a modified labium. I wish to decidedly state my disbelief in any such

homology. It is utterly unphilosphocal to accept without the clearest proof such a structural modification as this change in position of the mandibles would require, and the modification of the ordinary labium into a beak of this character is a process that ought to be proven. It seems to be assumed that the "labium" of the hemiptera is the same as the "labium" of the diptera, e. g. *Culex*, and if this is so, I have a paper now in press, in which I claim to prove that this "labium" in the diptera is really only a modified galea, or a maxillary structure. I hope to prove some time in the future, when I can get the necessary material, how this modification of the hemipterous mouth came about, and that the mandibles do not, habitually, become internal mouth structures so long as there are other organs enough more naturally situated.

EXPLANATION TO BASE FIGURES.

Fig. 1. *Siphonophora avenae.* *a*, beak; *b*, bristles of mouth—"mandibles" and "maxillae;" *c*, antenna of winged viviparous female.

Fig. 2. *Aphis brassicae.* *a*, antenna of wingless forms; *b*, antenna of winged viviparous female; *c*, beak of young lice; *d*, beak of mature, winged form.

Fig. 3. *Aphis cucumeris.* *a*, antenna of winged viviparous female; *b*, beak of wingless forms.

Fig. 4. *Myzus cerasi.* *a*, 3rd; *b*. 5th; *c*, 6th joint of antenna of winged viviparous female.

Fig. 5. *Aphis persicae-niger.* *a*, antenna of immature forms, joints 5 and 6; *b*, 3rd; *c*, 4th; *d*, 5th; *e*, 6th joint of antenna of winged viviparous female; *f*, sensory pit from front; *g*, same from side.

NOTES ON TWO SPECIES OF DATANA WITH DESCRIPTIONS OF THEIR LARVAL STAGES.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

Of all the closely related species of this genus, the two which approach each other the most nearly and are most difficult to distinguish in the imago state, are *D. major* and *D. drexelii*. I have elsewhere called attention to the main feature by which they are to be distinguished, which, after all, is only a matter of degree of coloration. The species differ, or rather tend to differ, in other points beside the brightness of the costal shade, namely, in the more entire outer margin of the primaries, and the darker more even coloration of the wings of *D. major*.

The size is the same in both species, there are no markedly distinctive male genital characters, and the lines and

spots are arranged in the same manner; in fact, there is no absolutely constant difference, either in structure, markings or coloration, between the two so far as I have been able to observe, and I have no doubt that specimens may occasionally occur which it would not be possible to refer positively to one species or the other by an examination of the imago alone. It would at first seem that these species must be more closely related than others in the genus, perhaps hardly yet distinct; but when we consider the larval stages, it is at once apparent that they are widely separated, more widely, in fact, than many other species of *Datana* which are readily separable in the imago state. This difference would seem to indicate rather a long inherited similarity between the moths than very recent derivation from a common ancestor. While the moths, it may be, have remained constant to their former type, or undergone a similar development, the larvae have diverged greatly, which would seem to correspond to the general rule in lepidoptera, that the larvae are often the first to vary. The eggs of *D. major* and *D. drexelii* differ markedly: the larval differences appear in the first stage and are kept up and intensified throughout the larval period, and only when the pupa stage is reached, does the close resemblance observed in the moths begin. The cause of the divergence in the larvae, especially at maturity, is not very obvious, particularly in the peculiar ornamentation of *D. major*, which differs from that of all of the other *Datana* larvae so far known.

D. drexelii is abnormal only in the predominance of yellow about the prothoracic and the 8th, 9th and 10th abdominal segments,* and this might serve as an excellent protection, in that the bunches of yellow striped larvae with their extremities elevated in their customary position, resemble the little clusters of flowers of the Witch-Hazel with their linear yellow petals, which begin to blossom in September, just as the larvae become conspicuous. What protection, if any, their coloration affords on the Deerberry, their other food-plant, I am unable to say, as they occur almost exclusively on the Witch-Hazel in this vicinity. (Rhinebeck, N. Y.)

But as to *D. major* its curious spots do not resemble anything so far as I can see. It is to be noted, however, that the habits of the two species differ, for while *D. drexelii* are always gregarious, *D. major*, when they do not separate entirely, feed farther apart, and tend to scatter more in the last stage than almost any other species, and the change in ornamentation from lines to spots, which they undergo in the last molt, may be of use to them with their changed habits.

DATANA MAJOR,. *G. & R.*

Egg. Sub-pyriform, of less diameter and cylindrical for a short distance at the top, recalling the structure of *D. palmii*; flattened at base or a little hollowed; evenly flat on top with a sharp angle between top and sides. Color uniform sublustrous white, a rather

* In this article, I have followed the nomenclature used by Dr. Packard for the larval segments, as it is not possible to describe intelligently the markings of *Datana* by the usual method.

large central black spot, larger than the corresponding one in *D. drexelii*. Greatest diameter 1.1 mm.; at the top .7 mm.; height .7 mm. Laid in groups of from 90 to 100 on the underside of a leaf of the food-plant.

First stage. Head rounded, black, shiny; width .5 mm. Cervical shield, anal plate, thoracic and anal feet and the abdominal feet outwardly, black. Body, wine red, a very broad subdorsal and lateral yellowish band nearly entirely replacing the ground color, and each bisected by a narrow red line. Venter without marks. A number of hairs growing from minute dark brown warts. These warts are proportionally larger in this stage than in any subsequent one. Hairs also arise from the cervical shield and anal feet. The larvae at this stage eat the parenchyma of the leaf from above, and when not feeding, rest on the lower surface or on the stems.

Second stage. Head rounded, rather higher than wide; shiny black, or with a slight brownish tinge; width 1.1 mm. Body dark wine red, the two pale greenish yellow bands on each side as before, very wide, nearly or quite lacking their central lines, so that all that is left of the ground color above is a narrow dorsal and subdorsal line. Venter wine red with a central narrow pale yellow line. The hairs from the cervical shield are long, the others short, arising from minute warts. As the stage advances, the lateral bands become somewhat more distinctly divided by the ground color and almost white, though still possessing a yellow tinge. During this stage and subsequently the larvae eat the whole leaf.

Third stage. Head higher than wide, narrowing a little toward the vertex, depressed at the sutures. Color sordid orange, becoming red-brown, the ocelli and mouth parts black. Width 1.6 mm. Cervical shield black or partly orange; feet and anal plate black, shiny. Body blackish brown, the stripes as before, yellowish white faintly bisected by a fine line of the ground color. Venter blackish vinous, with traces, more or less distinct, of a central white line. Bases of legs and corresponding spots on the apodous segments dark wine red, or orange tinted. Spiracles and the minute piliferous tubercles, black. Hair sordid white, short, but a few long ones overhang the head. As in the previous stage, the lines bisecting the lateral bands become more distinct with advancing growth, the ground color becomes darker, and the bands clear white. In many examples, a subventral line interrupted by the bases of the legs and a central ventral line are to be seen.

Fourth stage. Head as before, brownish red becoming darker; the mouth parts, antennae and ocelli, black; width 3.1 mm. Body black, with four lateral clear white stripes on each side, much broader than the intervening spaces, and three narrow ventral lines represented in some examples by a few linear dots only. Cervical shield light brown, anal plate black or partly brown, thoracic and anal feet and the abdominal feet outwardly black; bases of legs and

corresponding spots on the legless segments brownish red. Hair white, thin, longest at the extremities, the minute tubercles black. The lateral bands are not confluent at either extremity, though in some examples, there is a tendency for the third and fourth lateral (above and before the spiracles) to run together in the middle of the body.

Fifth stage. Immediately after molting before the colors have become fixed, the stripes are continuous as in the previous stage, but in a few hours the characteristic markings of this stage are assumed. Head as high as wide, rounded, shagreened, shiny; clypeus wrinkled and depressed in several places, principally along the upper part of the sutures; labrum wrinkled. Color, orange-brown to almost mahogany red; ocelli black, antennae and palpi ringed with black and white, their bases red; mandibles black, white inwardly; maxillae black. A few hairs sparsely distributed. Width 5.3 mm. Cervical shield, anal plate, bases of all the legs, and corresponding on the apodous segments (i.e. on the first, second, seventh and eighth, but *not* on the ninth, abdominal segments) mahogany red, the thoracic feet black, the abdominal orange brown, in some examples a little blackish outwardly. Body black, the ventral lines absent or represented by a few elongated dots, the lateral bands broken into rows of sub-quadrate spots, as I have elsewhere described.* This "serial atrophy" occurs in the following manner: — the three upper lateral stripes on each side are broken in each segmental suture and more or less broadly through the centre of the segment, the third lateral band (superstigmatal) less broadly than the others. The fourth lateral (substigmatal), the subventral, interrupted by the bases of the legs, and the central ventral (these last two are represented only by dots) are broken twice on each segment, once just before the spiracles and again toward the posterior edge of the segment, but are not broken in the sutures. In some examples, the posterior white spot of the third lateral band is again narrowly broken, and the bisegmental spot of the fourth row very narrowly in the sutures. The stigmatal spot of this row, when large, is apt to be broken at the spiracles. On the prothoracic segment, the two upper bands are represented by a white dot behind the cervical shield; the third, by a rectangular spot above the spiracle; the fourth by the bisegmental spot. On the ninth abdominal segment, the first row has a sub-quadrate spot, in some, followed by a dot; the second, a rectangular spot scarcely bisected, the third and fourth are normal. The tenth abdominal has only a dot representing the third lateral band, and the bisegmental spot representing the fourth. The subventral lines are represented by dots between each segment from the third to the eighth abdominal, and the ventral, by the bisegmental dots and a dot anterior to the bases of the legs on the second to the sixth abdominal segments.

* Can. ent., v. 21., p. 34.

Spiracles velvety black. Hair white, rather long, beside numerous fine, short black hairs, all growing from minute black tubercles. Length of larva at maturity 60 mm. The form of this larva with canary yellow bands and spots did not occur in any of the examples from which these notes were made (a brood of 55 and another large brood observed in the field). I have formerly found a few yellow ones among a brood of white spotted *D. major*, and occasionally a brood entirely yellow. Though the difference in coloration is very marked between the two forms, it is evidently, from its mode of occurrence, only a variation. A similar variation occurs in *D. palmii* * and less markedly in *D. contracta*.

Pupa. Formed in a subterraneous cell. In shape it is robust, cylindrical, thickest centrally, and rounded to the head; cases distinct; a slight creased elevation between the eyes. Abdominal segments slightly tapering; cremasters, two, very short, not well separated, each with three spines, the posterior one the longest, but often two, or partly aborted. Cases creased, body coarsely punctured, very finely in the movable sutures. Color dark or blackish mahogany. Length 25 mm., width 9 mm. This stage lasts through the winter and the species is single brooded. The duration of the larval stages was as follows: — 1st stage, not observed, but probably about five days; 2nd stage, 6 days; 3rd stage, 8 days; 4th stage, 9 days.

FOOD-PLANT: *Andromeda ligustrina*.

Larvæ from Ulster Co., N. Y.

DATANA DREXELII, *Hy. Edw.*

Egg. On the type of *D. ministra*. Subcylindrical, of a little greater diameter near the bottom than near the top; vertex rounded; base nearly flat. Color shiny whitish, the circular lid-like top very white and shiny, with a central small round black spot. Diameter .7 mm. In hatching, the larva eats away the lid, and emerges from the hole thus formed.

First stage. Head rounded, black, shiny; width .5 mm. When newly hatched, the larva is scarcely distinguishable from *D. major*. The anal feet are rather long and elevated. Body sordid yellow, cervical shield, anal plate and feet, blackish. A number of short hairs from the head and from about six rows of small blackish tubercles which are larger in proportion than in the subsequent stages. As the stage advances, the body becomes reddish with four lateral stripes on each side and three ventral, about as wide as the intervening spaces, dull yellow and confluent posteriorly. During this stage, the larvae eat the parenchyma in the same manner as *D. major*. I have estimated that a single larva eats about 90 sq. mm. of Witch-Hazel leaf.

Second stage. Head black and shiny with a few hairs, width 1.1 mm. Body brown, stripes dull yellow, narrower than the intervening spaces, extending

* I would like to call attention to the relationship that evidently exists between *D. palmii* and *D. major*. They are alike in egg structure, in the feature of bicolorous larval hairs (which does not occur in any other species to my knowledge), in coloration of head and lines and in the slightly scalloped forewings of the moth.

from the cervical shield and the anterior edge of the prothoracic segment to the anal plate and becoming a little confluent there. Cervical shield, anal plate, thoracic and anal feet and the abdominal feet outwardly black. Hair short and pale. During this stage, the larvae eat the whole leaf.

Third stage. Head higher than wide, depressed at the sutures of the clypeus; smooth shiny black, width 1.8 mm. Body brown, the stripes yellow, confluent posteriorly and along the anterior edge of the prothoracic segment. Otherwise as in the previous stage.

Fourth stage. Head shaped as before, smooth; centrally depressed at the top of the clypeus and more slightly along the central suture; clypeus and labrum wrinkled; all shining black; width 3.2 mm. Cervical shield black or partly brown, in some examples nearly all light brown; anal plate, thoracic feet and the abdominal feet outwardly, black. Body black or partly brown, the anterior half of the prothoracic segment yellow, the stripes strongly confluent on the last segment. The bases of the legs and corresponding spots on the legless segments, as in the mature larva, of a darker yellow than the lines. Each segment is shaded centrally with this yellow, but it does not cause the lines to appear confluent on account of its darker shade. Hair sordid white beside other short fine brownish hair seen with a lens.

Fifth stage. Head as high as wide, flattened in front, depressed at the upper part of the sutures of the clypeus, punctured. Clypeus and labrum somewhat wrinkled. Color shiny black, the antennae and palpi white-ringed, their bases greenish. Width 5.4 mm. Body black, cervical shield honey yellow, anal plate, thoracic and anal feet and the abdominal feet outwardly, black. Anterior half of the prothoracic segment yellow; stripes narrower than the spaces, citron yellow, running into the yellow part of the prothoracic segment and confluent posteriorly on the tenth abdominal, which is all yellow except the anal plate and a dorsal band. The three upper lateral lines are connected also on the eighth and ninth abdominal segments by a broad dark yellow shade. The bases of the legs and corresponding spots on the apodous segments (on the first, second, and seventh, eighth and ninth abdominal segments) also dark yellow, forming expansions of the subventral line and reaching the lowest lateral line, except on the thoracic segments and the ninth abdominal. On the apodous segments in the centre of each yellow patch, is a small black spot, representing the absent legs, but this is not present in all examples. Hair rather abundant, sordid white, the long and short hairs concolorous, arising from minute blackish tubercles which, in the black parts of the body, are each surrounded by a minute yellow ring.

Pupa. Exactly like that of *D. major;* the two cremasters each bear three spines in a transverse row, the posterior one the longest. Length 28 mm; width 10 mm.

Single brooded, the winter being passed in the pupa state beneath the

ground. The duration of the larval stages was as follows.— 1st stage, 5 days; 2nd stage, 6 days; 3rd stage, 6 days, 4th stage, 7 days; 5th stage, 7 days.

FOOD-PLANTS: *Hamamelis virginica*, *Vaccinium stamineum*.

Larvae from Ulster Co., N. Y.

THE NUMBER OF MOLTS OF LEPIDOPTEROUS LARVAE.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

Two articles have already appeared in PSYCHE on this subject * and it is evident from a perusal of them that considerable confusion exists as to the number of molts of certain species. In this article I propose to establish a criterion by which different observations may be compared and errors detected, for it is no difficult thing to overlook a molt or even to think one has occurred when it has not.

It will be seen by an examination of the following figures that the widths of the head of a larva in its successive stages follow a regular geometrical progression, and if, in examining the measurements of heads taken in following out a life history, any deviation from the calculated progression is shown, it is evidence that an error has been committed or that the larva has behaved in an abnormal manner; but the latter case can readily be distinguished from the former if a moderate degree of care has been exercised in taking the measurements. Hence, if two sets of observations show a different number of stages for the same insect but each follows its own progression, we may conclude that this variation is actual; but if either set shows a lack of regular progression that one we must regard with suspicion. Corroborative observations of the kind indicated are to be desired and until we have them we can not speak with confidence about the number of molts of any species. I recommend that all who hereafter describe larval stages give the width of the head for each stage. I have selected the *head* as the part not subject to growth during the stage, and its *width* as the most convenient measurement to take.

In the following I give first the calculated widths of head under each species, with the ratio, followed by those that were actually found. All measurements are in millimeters and may be considered accurate to within .1 mm. Certain irregularities are commented upon in the notes to which the small numbers refer.

FOUR STAGES.

Callosamia promethea Drury. calc. 1.1 1.6 2.3 3.3. 1.46
found 1.0 1.7 2.3 3.3 [1]

* Psyche, 5, p. 80
Psyche, 5, p. 95

FIVE STAGES.

Papilio cresphontes Cram. calc. .7 1.1 1.6 2.3 3.4. r .68
found .6 1.1 1.6 2.2 3.4

Eudamus tityrus, Fabr. calc. .6 1.0 1.7 2.8 4.7, r .60
found { .6 1.1 1.8 2.5[2] —
— — 1.7 3.2[8] 4.7

Syntomeida epilais, Walk. calc. .6 .8 1.1 1.5 2, r .73
found { .4[24]. 91 + — —
— — — 1.5 2.0

Datana drexelii Hy. Edw. calc. .6 1.1 1.9 3.2 5.4, r .60
found .5 1.1 1.7–1.9 3.2 5.4

Datana major G. & R. calc. .6 1.0 1.8 3.1 5.3, r .58
found .5 1.1 1.7 3.1 5.3

Datana palmii Beut. calc. .5 .9 1.5 2.7 4.6, r .58.
found .5 .9 1.6 2.7 4.6

Datana integerrima G. & R. calc. .5 .9 1.6 2.6 4.3, r .60
found — .9 1.6 2.7 4.3.

Datana perspicua G. & R. calc .7 1.1 1.7 2.7 4.1, r .65
found .5 1.1 1.6–8 2.7 4.1

Oedemasia concinna A. & S. calc. .45 .7 1.1 1.75 2.7, r .65
found { .4 1.0[5] 1.3 — —
— — 1.1 1.7 2.7

Schizura leptinoides Grote calc. .5 .8 1.3 2.1 3.3, r .64
found .5 .8 1.5 2.1 3.3

Schizura ipomeae Doubl. calc. .6 .9 1.4 2.2 3.3, r .66
found — — 1.5 2.2 3.3[6]

Heterocampa subrotata Harv. ♀ calc. .7 1.1 1.7 2.6 3.9, r.66
found .6 1.1 1.7 2.6 3.8

Heterocampa unicolor Pack. calc. .5 .8 1.3 2.0 3.2, r 64.
found .4 .7 1.35 2.1 3.2

Platysamia cecropia Linn. calc. 1.1 1.6 2.4 3.6 5.5, r .66
found { 1.3[7] 1.6 2.4 3.5 5.5
1.1 — — — —

SIX STAGES.

Euchaetes egle Harr. calc. .45 .6 .9 1.3 1.9 2.7, r .70
found — .6 .9 1.3 2.0 2 7

Edema albifrons S. & A. calc. .4 .6 1.0 1.7 2.7 4.3, r .62
found { .4 .7 1.3 1.7 2.3 —[8]
.4 .7 1.3 1.7 2.2 3.2

Dryopteris rosea Walk. calc. .25 .4 .6 .9 1.3 2.1, r .66
found .3 .4 .6 9. 1.3 2.2

Hyperchiria io Fabr. calc. .8 1.1 1.7 2.4 3.5 5.1, r .69
found .8 1.2 1.7 2.6 3.4 5.1

Clisiocampa americana Har. calc. .4 .6 .9 1.3 2.0 3.0, r. .66
found { .4 .6 — — — —
— — .9 1.3 2.0 3.0

Agrotis incivis Guen. calc. .4 .6 .9 1.3 2.0 3.0, r .66
found .2[9] .7? .9 1.3 2.0 3.0

SEVEN STAGES.

Halisidota harrisii Walsh. calc. .4 .6 .8 1.2 1.7 2.4 3.5, r .70
found { .4 .6 .9 1.4 1.6 2.3 3.5
.4 .6 — 1.3 1.7 2.6 3.6

Hyphantria cunea Drury. calc. .3 .4 .6 .8 1.2 1.7 2.4, r .70
found { .3 .4 .6 .81 .2 1.4[10] —
— — — — — — 2.4

Orgyia definita Pack. ♀ calc. .5 .7 1.0 1.4 2.0 2.8 4.0, r .70
found — .7 1.0 1.5 2.1 2.8 3.5[11]

EIGHT STAGES.

Scepsis edwardsii Grote. calc. .3 .4 .6

.9 1.2 1.6 2.2 3.0, r .73

found { .4 .5 .7 .9 .1.2 1.6 — —. — — — .9 1.2 1.6 2.3 3.0

NINE STAGES.

Halisidota caryae Harr. calc. .5 .7 .9 1.2 1.6 2.0 2.6 3.4 4.3, r .78

found .4 .6 — [12] 1.2 1.5 2.1 2.7 3.4 4.4

Halisidota tesselaris S. & A. calc. .5 .7 .9 1.2 1.6 2.0 2.6 3.4 4.3, r. 78

found { — — — 1.3 1.7 —[12] 2.7 3.5 4.3 .4 .6 .9 — 1.6 2.1 2.6 — —.

TEN STAGES.

Pyrrharctia isabella A. & S. calc. .4 .5 .7 .9 1.1 1.6 2.0 2.6 3.2 4.1, r .79

found .4 .5 .7 .9 1.2 1.6 2.2 2.6 3.6 [13] 4.1

NOTES.

[1] It will be seen that I corroborate the observations of Mr. W. H. Edwards in giving four stages to this species, and as my specimens were bred in Rhinebeck, N. Y. the theory of variation in the number of molts due to climatic influence suggested by Mrs. Dimmock (Psyche, v. 5. p. 29) does not appear to be sustained.

[2] This measurement, 2.5 mm., is too small as the larva was unable to cast its skin and the head was dwarfed.

[3] This is too large; it is possibly an error of observation and was not verified.

[4] An incorrect measurement. I find it marked with an (?) in my notes.

[5] A remarkable instance of excessive development. I do not think any error was made. The second example behaved in a normal manner as can be seen from what measurements I have.

[6] My observations do not agree with those of Dr. Packard on this species, who finds six stages. (Proc. Bost. soc. nat. hist. v. 24, p. 534.)

[7] The second example has the normal measurement. Possibly I have made an error in the first measurement.

[8] It will be seen that in both examples no series is followed, but both larvae became unhealthy and died in the fifth and sixth stages respectively which probably accounts for the dwarfed dimensions of their heads. This is one of the instances of abnormal development which is readily distinguishable from an error of omission.

For examples of the latter see note ([12]).

In giving six stages to this species I corroborate the observations of Mr. Beutenmüller (Ent. Amer., v. 6, p. 75) but disagree with Dr. Packard who finds but five stages. (Proc. Bost. soc. nat. hist., v. 24, p. 525.)

[9] An erroneous measurement. It is marked in my notes as carelessly taken.

[10] This larva died in the sixth stage and its head is seen to have been dwarfed.

[11] The last stage, width of head 3.5 mm., occurs only in larvae that produce female moths and it is seen to be too small for the series. I intend to make more observations on this species and will not comment on it further at this time.

[12] Examples of accidental omissions which were not detected at the time and which would have gone entirely unrecognized had it not been for the measurements recorded. On making calculations and observing the apparent omissions I endeavored to obtain more larvae. No young *caryae* were to be had, but some *tesselaris*, carefully watched exhibited the missing stage as may be seen from the second example.

[13] Probably an error. I found this larva very difficult to measure and this particular stage was not verified by measuring the cast head as most of the others were.

DESCRIPTIONS OF NEW WEST AFRICAN LYCAENIDAE.

BY W. J. HOLLAND, PITTSBURG, PA.

The insects described in the following pages were all taken upon the upper waters of the River Ogove in the French Territory of Gaboon. They were collected by my friend, Rev. A. C. Good, during his stay there, which terminated in the spring of the year 1889. It is my intention as soon as possible to publish figures of all of these species.

EULIPHYRA, gen. nov.

1. E. MIRIFICA, sp. nov.

Antennae short; palpi minute, compressed; body robust; anterior wings subtriangular, with the costa strongly arched, the apex truncate, beneath which the outer margin is excavated and concave; the inner margin is more or less sinuate. The posterior wings are subovate, strongly produced at the anal angle and scalloped on the lower third of the outer margin. The color of the upper surface of the wings is uniformly a dull black except that upon the inner margin of the primaries, about half-way between the base and the outer angle, there is a large subquadrate spot of pure white. The color of the under side of the primaries is fuscous shading at the apex into a lavender gray. There is a patch of sooty upon the costal margin and the upper part of the cell midway between the base and the apex. The white spot of the upper surface reappears upon the under side. The secondaries are lavender gray shading toward the outer margin into pale fuscous and ornamented by a number of very irregular dark maroon-colored lines and spots, which enclose at the end of the cell a large patch of silvery scales. Expanse of wings, 53 mm.

The specimen was developed from "a very singular chrysalis, short and thick, and unlike anything of the kind I have observed before, which was found upon the under side of a large leaf. It was black in color." (A. C. Good.)

Type ♂ in collection of Rev. W. J. Holland.

This insect is closely allied in some respects to *Liphyra leucyania*, Hew. Neither of them are truly referable to the genus *Liphyra* and I propose for their reception a new generic name *Euliphyra*.

EPITOLA, Westw.

2. E. SUBFULVIDA, sp. nov.

Upper side of head, antennae, palpi, and thorax dark brown; abdomen fulvous. Anterior wing strongly arched near the base, abruptly truncate at the apex, and slightly convex at the middle of the external margin; the posterior wing is subovate, with the outer margin evenly rounded; the inner margin is deeply excavated at the anal angle. The color of the anterior wing is deep cadmium yellow, with the costal margin and the outer margin broadly dark brown. A black spot, fusing with the dark brown costal margin, is located at the end of the cell. The posterior wings are of the same color as the anterior,

but the dark brown border is much wider and the cadmium yellow area is confined to a small space about the region of the cell. The inner margin, forming a groove in which the body is partly enclosed, is light yellow.

The undersurface of both wings is uniformly cadmium yellow. Under surface of the body, legs, and undersurface of the palpi of the same color. Expanse 33 mm.

Type ♀ in collection of Rev. W. J. Holland.

It is with the greatest hesitation that I refer this species to the genus *Epitola* It will with the following species probably constitute a new genus.

3. E. PURPURASCENS, sp. nov.

The description of the form of the wings of the preceding is also applicable to the present species. The prevalent color of the upper surface of both wings is a purplish gray of a very delicate cast. The cell of the primaries and a streak beyond it just below the costal margin are black. Just beyond the end of the cell the ground color of the wing fades into a pale blue, and the base of the wing is powdered with greenish scales. The outer margin is lightly shaded with brown. The posterior wings are uniformly of the ground color, save at the base, where they are powdered with greenish scales, and on the outer margin, where they are more narrowly brown than the primaries. The underside of both the primaries and the secondaries are lavender gray. Just before the apex of the primaries a narrow band of dark brown scales takes its rise upon the costa and is extended obliquely across the wing and continued upon the secondaries to the anal angle. The whole surface of both wings is further mottled with minute spots of dark brown, which under the microscope are seen to be composed of from three to five dark-colored scales. Expanse of wings 42 mm.

Type ♀ in collection of Rev. W. J. Holland.

4. E. GOODII, sp. nov.

Upper surface of both primaries and secondaries morpho-blue. The costa of the primaries from the base and the apical half of the wing are broadly black. The blue cuts into the broad black area of the wing near the end of the cell. The margin of the secondaries is very narrowly black except at the outer angle which is somewhat broadly fuscous.

The under surface of both wings is chalky white, traversed by a number of irregular bands of faint brown. There is a very narrow marginal black line. Expanse of wings 44 mm.

Type ♂ in collection of the author.

5. E. CERCENOIDES, sp. nov.

The prevalent color of the upper surface of both wings is a very intense lapis lazuli, showing in certain lights a beautiful greenish iridescence. The costal margin of the primaries is narrowly and the apical third broadly black. At the end of the cell there is a somewhat curved triangular spot of the same color, and the median and submedian nerves are covered with black scales toward the base. The anterior margin of the secondaries is broadly, and the external margin very narrowly black. The fringe of the primaries just before the outer angle, and the fringe of the secondaries just behind the outer angle is narrowly white. The underside of both wings is dark plumbeous, ornamented with numerous transverse bands of waved lines and sagittate spots of a pale blue color, of which those at the outer angle of the primaries are the broadest. Expanse of wings 36 mm.

Type ♂ in collection of the author.

6. E. BENITENSIS. sp. nov.

The costal margin of the primaries of this small and well marked species is very strongly arched and the apex is more acute than in any other species of which the writer has knowledge. The color of the upperside of the anterior wings is black, ornamented with blue spots, of which one, very small, is situated on the middle of the cell, and another of the same size, just beyond the cell; while five are disposed in the form of a transverse submarginal series which is interrupted between the second and third median nervules, and in which the spots increase in size toward the posterior margin. The base of the wing and the costa are powdered with a few scattering blue scales. The posterior wing is morpho-blue with the anterior and outer margins and the median nerve and nervules broadly black. The inner margin is gray. The prevalent color of the under surface of both wings is a dark wood brown. The discal area of the primaries is suffused with blackish. The spots of the upper side reappear upon the under side as very faint bluish gray markings, the edges of which are rather sharper than upon the upper side. There is in addition a faint marginal band of lunules. The secondaries are ornamented with a similar faint marginal and submarginal band of lunules, and with three or four spots about the end of the cell. Head, thorax, and abdomen concolorous. Expanse of wings 30 mm.

Type ♂ in collection of the writer.

7. E. UMBRATILIS, sp. nov.

Allied to *E. marginata*, Kirby, but differing from this species in being of a paler blue upon the upper surface, and by not having the margin of the wings denticulated and the denticulations dusted with white. Upon the under side there are also marked differences. The general ground color is as in Kirby's species, but the irregular zig-zag markings are more numerous and more sharply defined than in *E. marginata*, and are disposed in well-marked transverse series giving the wing a somewhat banded appearance.

PHYTALA, Westw.

8. P. ELAIS, Doub, Hew. *Female*.

The female of this interesting species, so far as I am at present aware, has not hitherto been described. I have a specimen taken *in coitu* with a typical male. It is uniformly brown upon the upper side except upon the apical half of the primaries where the brown shades gradually shade into deep velvety black, which is interrupted beyond the end of the cell by a broad subapical band of yellow which extends from the costa to the third median nervule, and is constricted at the upper radial. The under side is not materially different in markings from the male, except that the yellow band faintly re-appears, and the general tone of the markings is lighter. Expanse of wings, 67 mm. The example was taken upon 5th Jan., 1887, at Kangwe.

PSEUDERESIA, Butl.

9. P. O-RUBRUM sp. nov.

This species is closely allied to *P. Catalina*, Kirby and Smith, but differs

in the almost entire absence of any red markings on both sides of the wings. My sole example is a female.

The upper side of the head, body and wings is uniformly dark brown. The under side is also dark brown, becoming paler at the base and the outer margins of both wings, which have a faint submarginal and marginal band of sagittate grayish spots disposed regularly upon the intra-neural spaces. Four vermilion spots are clustered about the end of the cell in the secondaries, and all of these except the one just beyond the end of the cell are pupilled with dark brown, giving them the appearance of the letter "O" in crimson. Expanse of wings 40 mm.

Type in author's collection.

10. P. LATRUNCULARIA, sp. nov.

Allied to *P. helena*, Druce, but differing in the following particulars:

1st. The *total absence of all crimson markings*,

2nd. *The spots of the under side*, which agree in the main in location with the spots of the under side of *P. helena*, as figured in Kirby & Smith (except that the red ones are wanting), are *not yellow* but brilliant white and larger, and more sharply defined. Otherwise the description of Mr. Druce holds good.

This may prove to be a local or seasonal form of *P. helena*.

Type ♂ in collection of the author.

11. P. DESPECTA, sp. nov.

♂. Upper surface uniformly dull purplish black. Under side dull blackish gray, darkest at the base of the primaries. Both the primaries and the secondaries are traversed by marginal, submarginal, and median bands of pale whitish sagittate marks. There are also upon the secondaries a number of obscure little markings in the region of the cell.

♀. The female is like the male except that the apex of the primaries is less acute and the outer margin more rounded, and the color of the upper surface is pale reddish brown.

Described from 5 ♂♂ and 2 ♀♀ in the author's collection.

SPALGIS. Moore.

12. S. S-SIGNATA, sp. nov.

♂. Upperside. Head, thorax, abdomen, and anterior wing upon the base, anterior margin, apex, and outer margin, black. The rest of the upper surface of the wings pure white, except that there is a very fine black marginal line surrounding the secondaries, and that the extremities of the nervules of these wings are marked with black points. Underside. The underside is white shading into a very pale gray upon the costal and outer margin of the primaries. This shade is due apparently to the black upon the upper surface. The anterior wing has a triplicate, and the posterior wing a geminate marginal line. These are followed toward the base by series of more or less broken and interrupted lines, more thickly distributed at the base than elsewhere. In the cell there are two annular spots, of which the outermost and largest has the appearance of the letter "S." The ends of the nervures are tipped with black. Expanse 34 mm.

♀. The female has the anterior wings with the apex less produced, and the outer margin more rounded. The outer margin of the secondaries is also broadly black like the margin of the anterior wings. The under-

side is white, all the narrow lines and markings which appear in the case of the male being obsolete except those about the outer margins of the wings. Expanse 30 mm.

Described from examples taken *in coitu*, and contained in the collection of the author.

It is with much hesitation that I refer this insect to Mr. Moore's genus *Spalgis*, but it comes nearer to it apparently than to any other of these erected by lepidopterists. It will probably become the representative of a new genus, when the future revision of the *lycaenidae* takes place.

LACHNOCNEMA, Trim.

13. L. EXIGUUS, sp. nov.

Upperside. Head, thorax, abdomen and antennae black. Wings white with the costal and outer margins of the anteriors and the outer margin of the secondaries broadly black.

Underside. Legs white, and also the abdomen except at the tip where it is fuscous. Wings white with the costa of the primaries narrowly and the apical third broadly washed with pale wood brown. The outer margin of the secondaries is also broadly suffused with the same color. Near the apex of the primaries there is a submarginal row of three and a marginal row of five gilt spots. Near the anal angle of the secondaries there is a similar series of marginal and submarginal spots, and upon the anterior margin of the secondaries there are three elongated coppery gilt spots. Expanse 25 mm.

Type ♂ in collection of the author.

LARINOPODA, Butler.

14. L. PERFRAGILIS, sp. nov.

Upper side. Antennae, head, thorax, and abdomen black. Wings pellucid, white. The costal and outer margins of the primaries are somewhat broadly and the outer margin of the secondaries very narrowly laved with black. There is a round black spot at the end of the cell of the secondaries.

Under side. Exactly as the upper. The legs are crimson. Expanse of wings 40 mm.

Type in coll. Holland.

15. L. CAMPIMUS, sp. nov.

Allied to *L. libyssa*, Hew., and closely resembling it upon the upper side. The broad black margin of the wings is however quite regular and not excavated on the costa at the end of the cell of the primaries, and just below the outer angle of the secondaries as in *L. libyssa*, and the markings of the under surface being different do not appear the same upon the upper surface which permits of their being seen on account of the partly diaphanous nature of the wings. Underside. Anterior wings white, with the costal and outer margins broadly black, the black being extended downward upon the cell in the form of a couple of teeth. At the apex the black area is interrupted by a lunate white spot and a narrow marginal line. The posterior wings are also white with the outer and inner margins broadly black. Just before the middle of the anterior margin a broad straight band of black arises and crosses the wing diagonally to the inner margin; a similar black band extending from near the outer angle of the wing runs parallel to and at a slight remove from the anterior margin and coalesces with the broad black diagonal band. The broad outer band of black is adorned near the outer angle by a large white spot which is followed toward the anal angle by several smaller spots of the same color. Expanse 28 mm.

Type ♂ in collection of the writer.

D'URBANIA, Trim.

16. D. MONDO, sp. nov.

Upperside of head, antennae, and body dark brown. Ground color of both wings orange red. The base and costa of the anterior wing is covered with minute blackish striae and spots. The apex and outer margin are black. There are three black spots in the cell of which the outermost is the largest, and there are three connected and somewhat irregular spots which form a band running from the middle of the costa toward the outer margin with which they partly fuse. The outer margin of the secondaries is broadly dark brown, and the surface of the wing is very densely mottled with the little spots and striae described as appearing upon the primaries. This maculation is least dense upon the nervures, and the wing has thus a rayed appearance imparted to it. The underside of the anterior wing is lighter red than the upper; the base, costa, apex, and outer margin are gray irrorrated with minute black dots. The spots reappear as upon the upper surface, and in addition a large spot between the second and third median nervules. The underside of the secondaries is of the same gray color as the base of the primaries. There is a waved marginal line, an interrupted submarginal series of black spots arranged in two groups of three spots each; a transverse series of four spots extending across the wing, the spot nearest the inner margin being the smallest, and three spots at the base. These spots are not quite constant, and there are sometimes one or two more minute ones upon the wing. The female does not differ materially from the male. Expanse of wings ♂ 35 mm., ♀ 32. mm.

Described from four males and two females in author's collection.

17. D. OSHEBA, sp. nov.

Upperside of head and body black. Wings with their outer margins scalloped and the fringes narrowly gray between the extremities of the nervules. The anterior wing is broadly black, with a minute spot of crimson near the base and a larger spot of the same color on the posterior margin. The hindwing is crimson bordered evenly with black. In some specimens the border is narrower on the inner margin. There are a number of small black spots at the base. The underside of the wings is brown with a plumbeous sheen. There are a few obscure dark marks at the base of both wings. The crimson spot at the posterior margin of the primaries reappears upon the lower side and is surmounted by a small spot of the same color. There are a few crimson spots at the base of the secondaries, and a curved band of crimson spots crosses the middle of the wing, which is darker in the region of this band than elsewhere. The female does not materially differ from the male except as that sex always differs in the genus by having the apex of the primaries less acute. Expanse of wings 27 mm.

Described from two males and two females in author's collection.

18. D. ASHIRA, sp. nov.

Allied to *D. libentina*, Hew. Upper surface of the wings uniformly black except at the anal angle of the secondaries where there is a large subovate crimson spot. The underside is marked very much as in *D. libentina* but the ground color is darker and the crimson spots smaller and differently shaped. Nothing but a good figure can convey the idea of these differences, and such a figure I hope soon to publish.

Type in collection of the author.

19. D. OLOMBO, sp. nov.

Ground color of the upper side of the wings tawny red. The costal and outer margin of the primaries broadly black, as also the outer margin of the secondaries. The inner matter of the latter and the base fuscous. The ground color of the underside of the primaries is pale reddish, palest at the posterior margin. The broad black border of the costa is broken near the middle by a line of the ground color which passes upwards to the edge of the costa. This is followed toward the apex by two narrow dashes of ochraceous, two submarginal bands of sagittate spots decreasing in size from the costal margin, and by a narrow marginal line. The ground color of the underside of the secondaries is ochraceous. The black border is interrupted by a narrow marginal line and the double band of sagittate spots like that on the primaries. Beyond this toward the base are from twelve to fourteen spots of black of which the one at the middle of the anterior margin which is subquadrate in form is the largest. The male and female are not unlike. Expanse of wings 35 to 39 mm.

Described from five examples in collection of the author.

TERIOMIMA, Kirby.

20. T. LEUCOSTOLA, sp. nov.

Allied to *T. tenera*, Kirby. The wings are white. The costal margin of the primaries is very narrowly and the apical third very broadly blackish gray, with the dark margin, however, terminating abruptly before reaching the inner angle. There is no black border upon the secondaries. The underside is uniformly creamy white, with a faint trace of a black marginal line near the apex of the primaries. Fringe very narrowly black checkered with white. Legs black. Expanse of wings 28 mm.

Described from four examples in collection of the author.

21. T. XANTHOSTOLA, sp. nov.

Allied to the preceding species. The ground color of the wings is pale luteous. The costa and the apical third are bordered with black as in the preceding species, but the inner margin of the black border is more evenly rounded than in *T. leucostola*, and reaches to the outer angle of the wing. The anal angle of the secondaries is slightly margined with grayish. Underneath there are no dark markings except faint traces of a marginal line here and there. The fringe is exceedingly narrow and dark brown checkered with pale gray. Legs dark brown. Expanse of wings 26 mm.

Described from numerous examples in the collection of the author.

22. T. XANTHIS, sp. nov.

Allied to *Pentila* (?) *evanescens*, Kirby. It differs in being smaller, darker yellow, without any blackish border on the primaries except at the tip, and no trace whatever of such a border upon the secondaries. The underside is immaculate and the only ornamentation consists of a faint submarginal band near the apex of the primaries, and three faint lines traversing the posterior wings parallel to the outer border upon the outer third. Expanse 27 mm.

Described from numerous examples in the collection of the author.

APHNAEUS, Hübn.

23. A. ILOGO sp. nov.

Allied to *A. orcas*, Drury. Upperside·

Front and a narrow line around the eyes white Antennae, head, thorax, and abdomen black. Primaries black, with the lower third of the wing almost to the outer margin densely covered with blue scales. There are besides three small blue spots on the cell near the base, and two at the end of the cell pupilled with white. Beyond these a few scattering blue scales. Secondaries black laved with blue upon the discal area. There are two small white spots at the point where the longest of the two tails joins the outer margin, and at the indentation of the inner margin just above the anal lobe there is a white spot. Underside. The ground color is deep cadmium orange. The fringes are black. The wings are ornamented with silvered spots bordered with black, and disposed as follows:—Upon the anterior wing, a round spot upon the cell near the base, followed by a figure 8 spot on the middle and a long spot at the end of the ceil; beyond this near the costa three small spots closely clustered, below these a larger oval spot, and between the median nervules at their origin two small spots the border of the lower one of which fuses with the border surrounding the very large spot which covers almost the entire inner margin of the wing: there are six small submarginal spots, three near the apex, and three near the inner angle of the wing;—upon the posterior wing a small spot upon the costa at the base, a round spot in the cell and two oval spots which coalesce at the end and a small oval spot below the cell, beyond these a curved series of six spots, of which the third is very small and the last geminate situated below the first median nervule; upon the inner margin about the middle is a round spot succeeded by an oblique bar having at its outer extremity a small spot, this is succeeded by another shorter bar, at the end of which is a short curved series of three small spots. Just above the anal lobe there is a small triangular mark. The anal lobe is black, ornamented with two silvery blue spots. Tails black narrowly tipped with white. Underside of the palpi orange, legs and abdomen black ringed with white. Expanse of wings 36 mm.

Type ♂ in author's collection.

24 A. ARGENTEOLA sp. nov.

Allied to the preceding species. Upperside:—Antennae, head, thorax, and abdomen black. Wings brilliant greenish blue, with the costa and apical third of the primaries and costal and inner margins of the secondaries broadly black. Anal lobe black minutely spotted and margined with white. Tails black tipped with white. Underside:—Ground color rich maroon, shading upon the inner margin of the primaries into fuscous. The spots are located as in the preceding species but with certain marked differences. 1st. They are all smaller, more sharply defined, and less disposed to fuse. 2ndly, Upon the anterior wing the three clustered spots are succeeded by a long silvery bar extending outwardly toward the margin, instead of by an oval spot. 3rdly, The spots of the secondaries are more numerous and their disposition is slightly different. 4thly, The submarginal series of spots on both wings is composed of almost obsolete grayish points without any apparent trace of silvery pupillation in the specimens I have seen. Expanse of wings 23mm.

Type ♂ in author's collection.

25. A. CRUSTARIA, sp. nov.

Upperside:—Head and body black. Wings morpho-blue, the costa and apical third of the primaries and anal lobe of the secondaries black. Underside:—The ground color of the wings is pale stramineous. The fringes are very narrowly black checked with the ground color. There is a double marginal line of fuscous upon both wings. The spots are silvery copper bordered with reddish gray. Upon the primaries these spots are arranged

as transverse bars at right angles to the costal margin. Near the base of this wing below the cell there is a dark fuliginous mark. The spots upon the secondaries are crowded together toward the base and again toward the outer margin, leaving a clear discal band of the ground color visible. Three small round spots near the base and a quadrate bar in the outer series are conspicuous because showing no silvery pupillation and being darker in color than the rest. Anal lobe black. Palpi, legs and body concolorous. Expanse 27 mm.

Type ♂ in collection of the author.

26. A. ARGYROCYCLUS, sp. nov.

♀. Allied to *A. orcas*, Drury, but differing widely in important particulars from the female of that species.

Upperside:—The prevalent color is dark greenish brown glossing with blue in certain lights. There is a large white spot at the end of the cell of the primaries followed by a subapical series of very small and obscure spots. Underside:—The ground color is dark orange fading upon the inner margin of the primaries into pale testaceous. The fringes are black checked with white at the tips of the nervures. The anal lobe is black. The silvery spots adorning the wings are relatively large and ringed with dark maroon. Instead of the one long spot which stands upon the primaries of *A. orcas* the fourth from the base, there are in *A. argyrocyclus* three spots grouped triangularly. Instead of the nine silver spots which appear upon the secondaries of *A. orcas* there are in *A. argyrocyclus* sixteen spots and all lying within the submarginal band of dark maroon which in both species appears upon the secondaries. Expanse of wings 40 mm.

Type in collection of author.

Pittsburg, Pa., 10 Nov. 1890.

SOME GENERA OF OEDIPODIDAE RESCUED FROM THE TRYXALIDAE.

BY SAMUEL HUBBARD SCUDDER, CAMBRIDGE, MASS.

In his Prodromus Oedipodiorum, Saussure constructs a table for the separation of the genera of this family, in which, when he has reached the "stirps Oedipoda," afterwards termed by him Oedipodites, he first separates from the remainder of the stirps the new genus *Daemonea*, an extraordinary form from Peru, known to him apparently only by a single imperfect and immature specimen in Brunner's collection. This genus he found to differ from all others in the forward extension of the vertex, "faciem adumbrans," the stout form of the hind femora with slight carinae, the great length of the hind tarsi which are nearly two thirds as long as the hind tibiae, and the peculiar concave structure of the dorsal surface of the pronotum.

In a recent study of some American species of *acridiodea* I have been greatly puzzled by a number of forms which seemed to lie on the border land between the *oedipodidae* and the *tryxalidae*. One by one they have been removed in my collection from one family and the other without finding a

resting place, until their comparative examination, after a general survey had been completed, showed me that they possessed features in common which warranted their being grouped together and placed as a whole in the *oedipodidae*, although several of them present marked Tryxaline features. I had concluded to regard them as a distinct subfamily of *oedipodidae*, when I dicovered that one of them, the genus *Hippacris*, described by me many years ago* from Peru as an exceptional form of *tryxalidae*, was very closely related indeed to Saussure's *Daemonea*, so much so that the latter genus also would have to be placed in the same category; this separate treatment, but under the name of a stirps, I believe *Daemonea* and *Hippacris* would have received at Saussure's hands, had he possessed a specimen of the latter; and to this assemblage of forms I propose to give the subfamily name of

ACROLOPHITINAE.

The distinguishing characteristic of the members of this group among *oedipodidae* is that the front and vertex conspire to form an advancing process, sometimes also ascending, in the upper front of the head, much as in *Colpolopha* among *acrididae*, and in many *phymatidae*, and of course reminding us of *tryxalidae*; but in such other characteristics of structure as would be regarded as more commonly found in the *tryxalidae* than in the *oedipodidae*, they almost invariably incline to the latter group; and where any one of them shows a Tryxaline feature (besides the fronto-vertical process) in any marked degree, it is almost sure to be offset by some other more striking Oedipodine features and often by a combination of several. As a general rule, the face is almost perpendicular below the fronto-vertical process, which with the process causes the upper portion to be more or less concave. The eyes, except in *Peruvia* and especially in *Gymnes*, are remarkably small, generally very much shorter than the infraocular portion of the genae; the antennae are linear or faintly ensiform and usually depressed on the basal joints; the metazona is always somewhat though rarely much longer than the prozona, with the posterior process subrectangulate or broadly rounded, generally with a slight median carina running through the whole pronotum, but crested on the metazona in *Acrolophitus*, and almost absolutely absent in the genera at the other end of the series; the prozona traversed by a pair of faintly incised continuous transverse sulci, the hinder never confused with the typical sulcus separating the prozona and metazona; lateral lobes of the pronotum with the anterior and posterior margins parallel or subparallel, except in *Hippacris* (and *Daemonea*?); the mediastinal and scapular areas in the basal half of the tegmina more or less, sometimes very, irregularly reticulate, never with simple transverse parallel veins; the vena intercalata generally obscure, sometimes wanting, the vena axillaris sometimes free, sometimes impinging on the anal vein; metasternal lobes distant (except in *Peruvia*).

There is no doubt that *Hippacris* and *Daemonea* are widely separated from the others and that fully to justify their collocation in this manner intermediate types should be found; these are to be sought in the western tropics of America. It should not, however, be overlooked that in the form of the lateral lobes of the pronotum *Hippacri*

*Proc. Bost. soc. nat. hist., 1875, v. 17, p. 267.

and *Daemonea* are far more Tryxaline than any of the others, for the posterior margin rapidly retreats from the very tip, so that the lobe narrows perspicuously. The features in which these two genera stand apart from the others will be seen in the following table of the genera of this group, in which I have placed all known to me.

TABLE OF THE GENERA OF ACROLOPHITINAE.

Body slender; vertex horizontal or ascending at apex, the tip bluntly pointed; frontal costa extending to clypeus; metazona above transversely convex or tectiform or plane with a median carina, never concave; lower posterior angle of lateral lobes of prothorax subrectangulate; hind legs relatively long; hind femora slender, elongate and compressed; hind tibiae with more than eight spines in the outer row; hind tarsi less than half as long as hind tibiae.

Head as viewed laterally with distinctly ascending vertex; face below fronto-vertical process subperpendicular; metazona distinctly elevated above the prozona, tumid or crested; antennae more than half as long as the tegmina.

Metazona much longer than prozona, with an elevated crest. *Acrolophitus.*

Metazona barely longer than prozona, tumid, but with only a slight carina ....*Acrocara.*

Head as viewed laterally with vertex scarcely or not ascending; face below fronto-vertical process distinctly though not greatly declivent; metazona hardly or not elevated above the prozona, rarely tumid, never more than gently carinate; antennae less than half as long as the tegmina.

Antennae much longer than the face; lower margin of lateral lobes of prothorax anteriorly excised, broadly exposing the pleural plate.

Antennae entirely filiform; dorsum of metazona raised at an exceedingly small angle with that of the prozona; anterior margin of tegmina shouldered but not distinctly lobed near the base; last hind tarsal joint hardly more than half as long as the other two together.

Pedioscirtetes.

Antennae with the joints of the basal third depressed and slightly broader than beyond; dorsum of prozona and metazona in same plane: anterior margin of tegmina distinctly lobed near the base; last hind tarsal joint (at least in *Machaerocera*) longer than the other two joints together.

Fastigium of vertex longitudinally sulcate with no median carina; median carina of pronotum subobsolete between the sulci of the prozona; posterior margin of lateral lobes not produced posteriorly at its extremity; axillary vein of tegmina free; ulnar vein normal.

Machaerocera.

Fastigium of vertex transversely tumid with a distinct median carina in addition; median carina of pronotum equally distinct throughout; posterior margin of lateral lobes produced posteriorly at the extremity into a slight rounded lobe; axillary vein of tegmina impinging on the anal at the end of the basal third of the wing; ulnar vein approaching the median...*Peruvia.*

Antennae shorter than the face; lower margin of lateral lobes of prothorax

nearly horizontal throughout, scarcely permitting the pleural plate to be seen. *Gymnes.*

Body very stout; vertex slightly descending at apex, the tip truncate; frontal costa not extending over the lower half of the face; metazona above transversely concave; lower posterior angle of lateral lobes of prothorax decidedly obtusangulate; hind legs relatively short; hind femora short and stout; hind tibiae with not more than eight spines in the outer row; hind tarsi more than half as long as hind tibiae.

Vertex gently convex between the eyes; transverse sulci of pronotum faintly traced except at the lateral canthi and there not deep, each subordinate lobe at this point armed with a rounded tubercle..... ..... *Hippacris.*

Vertex transversely sulcate between the eyes; transverse sulci of the pronotum distinct, cutting deeply through the sharp lateral canthi..... *Daemonea.*

From one of the early explorations next the eastern base of the Rocky Mountains under Major Long, Say was able to bring home many curious insects which for a long time were known only by his descriptions. One of these was his *Gryllus hirtipes* taken "on the banks of the Arkansaw River, about a hundred and fifty miles from the mountains." This striking and beautifully marked insect is still a rarity, and was not mentioned from the time of Say's description in 1825 until 1871 when Thomas in one of Hayden's Reports established for it the genus *Acrolophitus*, but left us at a loss as to its position, as he placed it with *Tomonotus* Sauss., an Oedipodid, between *Stauronotus* and *Stenobothrus*, the last two being well known *tryxalidae*; two years later however, in his Synopsis of the Acrididae he plainly refers it to a "section" containing only *tryxalidae*. No one has since disturbed it. It can hardly have been known to Saussure, the latest monographer of the *oedipodidae*.

As stated above however it is plainly one of the *oedipodidae*, for although the vertex is ascending and prominent, forming a distinct frontal process which makes it present a very curious aspect among *oedipodidae*, while the vena intercalata of the tegmina is feeble and irregular or wanting, yet its other characteristics are all of another kind. The front is subperpendicular, except for the slightly projecting process above; the eyes are very small and not more than half as long as the infraocular portion of the genae; the antennae are linear; the pronotum is crested (but on the metazona only), the metazona much longer than the prozona, rectangulate behind; the transverse sulci of the prozona are continuous and intersect the slight median carina; the anterior and posterior margins of the lateral lobes are subparallel; the basal half of the marginal area of the tegmina is irregularly and rather densely reticulate; the anal and axillary veins are independent; and the lobes of the metasternum are rather widely distant. Except for the fronto-vertical process the aspect is wholly Oedipodine. The structural features mentioned by Thomas being an insufficient characterization of this curious genus, the following description may here find a place.

Acrolophitus Thomas.

Body moderately slender. Head moderately large, slightly enlarging below, giving greater effect to the subconical ascending and advancing process, which is nearly as long as the eye and is formed of the extension of the front and vertex; the latter attenuate in front, forming slightly less than a right angle with the upper part of the frontal costa, the angle minutely rounded; frontal costa slender, the sides faintly converging from below upward, above the median ocellus more rapidly convergent and at extreme summit pinched to a lamina, below it sulcate, the lateral carinae of the face conspicuous throughout; fastigia obsolescent but not confounded with the vertex, their position at the convex base of the lateral ridge of the frontal process being clear but not sharply defined, the fastigia being in no way depressed, not visible from above. Lateral ocelli far removed from the margin of the vertex, close to the eyes. Eyes small, feebly prominent, not more than half as long as the infraocular portion of the genae. Antennae half as long again as head and prothorax together, nearly as long as the hind femora, rather coarse, the first joint nearly twice as long as broad, but little stouter than the succeeding, the joints of the apical half or more punctate.

Prothorax with the prozona quadrate with parallel sides, the dorsum depressed but transversely and gently arched, the metazona tapering slightly forward, the dorsum tectiform and strongly crested, — this with the elevated head giving it a strong selliform aspect; prozona with the median carina very obscure, distinctly intersected not only by the typical sulcus (which is thrust forward by the metazonal crest) but also by two additional sulci, between which the carina is entirely obliterated; metazona strongly and roundly crested, the hind margin rectangulate, the lateral carinae distinctly intersected by the typical sulcus, which extends normally into the lateral lobes; these have the posterior angle rectangulate, the lower margin obtusely angular, its hinder portion horizontal, its anterior obliquely ascending; metasternal lobes in ♂ nearly, in ♀ fully, as far apart as the mesosternal, both quadrate or transversely quadrate. Tegmina almost uniformly coriaceous throughout but feebly membranaceous apically, moderately slender, rather densely reticulate, supplied normally with spurious veins, the vena intercalata vague or lacking, the vena media and vena discoidalis both furcate, the vena axillaris independent. Radiate veins of anal field of wings normal, not incrassate. Hind femora slender, longer than the abdomen; spurs of hind tibiae strong, curved, arcuate, of considerable length but the inner scarcely two thirds as long as the first joint of the tarsi, which are of normal length.

These characteristics, apart from the pointed head, seem to show the nearest relation to *Leptoternis*, *Conipoda* and allied genera of the Old World; but *Acrolophitus* is still far removed from them, and though not so extraordinary a form as Saussure's *Daemonea* from South America, certainly shows many features which recall that strange type, and forms one link in a series connecting the typical *oedipodinae* therewith.

I know of but one species of the genus, *A. hirtipes*, first found by Say on the upper Arkansas and since reported from near Cañon City, Colorado, and Fort D. A. Russell, Wyoming (Thomas), and southern Colorado (Carpenter), and taken in Colorado 5000′ (Morrison), between Lakin, Western Kansas, and Pueblo, Col., July 8–9, 1877 (Scudder), at Pueblo, Col., July 8–9 and August 30–31, 1877 (Scudder), Meridian Creek, Tex., June 6, "very rare, found among bushes" (Belfrage), and

Pecos River, Tex. (Capt. Pope). Mr. P. R. Uhler has also given me specimens from Kansas and Texas. It seems to have been oftenest taken near its first known locality, on the upper Arkansas, east of the mountains.

The next genus mentioned in the table is closely allied to the preceding, but departs in a greater degree from the Oedipodine type. Except for lacking a metazonal crest on the pronotum, it bears indeed a striking resemblance to *Acrolophitus*, a resemblance which is most marked in the strange form of the head in both. The points, however, in which it further departs from the normal Oedipodine type are not many and may be summed up as follows: The prozona and metazona are of equal length, the latter obtusely and roundly angulate behind, the angulation scarcely perceptible: the basal third or fourth of the marginal area of the tegmina is reticulate indeed, but the reticulation is sometimes mostly made up of crowded transverse veinlets interlinked by inosculating longitudinal veins; and the axillary vein unites with the anal by the end of the basal fourth of the wing, much as in *Tropidolophus*. It does not appear to have been described, and may be characterized as follows.

ACROCARA (ἄκρος, κάρα) gen. nov.

Body slender, subfusiform. Head of the same general form as in *Acrolophitus*, but somewhat more slender and with the fronto-vertical process sometimes somewhat more advanced; the vertex attenuate and conical in front, slightly declivent at extreme tip, forming in general considerably less than a right angle with the upper, gently convex portion of the frontal costa; its upper surface is plane or plano-convex; frontal costa very similar to that of *Acrolophitus* but not so strongly compressed above the ocellus and compressed more uniformly and over a broader area, allowing the median sulcus to extend to the vertex though as slender as possible in the compressed portion; its sides are also less regularly convergent, being either disturbed by a rounded divergence, just above the extreme base, which just fails of reaching the clypeus or else parallel below; lateral carinae of the face moderate, straight, divergent; fastigia and lateral ocelli as in *Acrolophitus*. Eyes small, not very prominent, a little longer then half the infraocular portion of the genae. Antennae twice as long as the head and thorax together, longer than the hind femora, moderately coarse, the first joint as in *Acrolophitus*, the succeeding joints cylindrical and equal and the joints of the apical two thirds punctate (♂), or a little more than half as long again as head and thorax together, shorter than the hind femora, the joints beyond the basal sometimes depressed and then tapering to the apex (♀).

Prothorax with the prozona subquadrate with parallel sides, the dorsum not depressed but regularly arched transversely, in the ♀ with a slight tendency to be tectiform, the metazona tapering strongly forward and slightly tumid, the dorsum depressed but slightly tumid, this tumidity with the elevated head giving the whole a somewhat selliform aspect; prozona with the median carina subobsolete, distinctly intersected not only by the exactly transverse, typical sulcus, but also by two additional sulci, between which the carina is sometimes entirely obliterated; metazona with a distinct but slight and uniform median carina fading at the extremities, the hind margin obtusely and roundly angulate, the lateral carinae distinctly intersected by the typical sulcus which extends normally into the lateral lobes;

these have the posterior lower angle rectangulate, the extreme angle rounded, the lower margin barely angulate, the hinder portion subhorizontal, its anterior slightly ascending; metasternal lobes in ♂ about three fourths as far apart as the mesosternal, in the ♀ as far apart, subquadrate with convex sides. Tegmina slender, coriaceous throughout, but nowhere densely and less densely apically, rather densely reticulate on the basal half, normally supplied with spurious veins, the vena intercalata rather feeble and irregular but present, the vena media and vena discoidalis both furcate, the vena axillaris impinging on the vena analis. Radiate veins of anal field of wings normal, not incrassate. Hind femora slender, longer (♂), or slightly shorter (♀), than the abdomen; spurs of hind tibiae as in *Acrolophitus*; hind tarsi of normal length.

It will be seen from these details, that, notwithstanding the different character of the dorsal portion of the metazona the close relationship of *Acrocara* and *Acrolophitus* is clear. Two specimens are known to me, which may be separated as follows:—

Lateral margins of frontal costa convergent at base; fastigium of vertex as viewed above not projecting beyond the middle of the eyes by more than their distance apart at this point; middle half of wing occupied by a broad dark band.....*pulchellum*.

Lateral margins of frontal costa convergent at base; fastigium of vertex as viewed above projecting beyond the middle of the eyes by considerably more than their distance apart at this point; almost the entire wing dark.....*maculipenne*.

Bruner's *Pedioscirtetes pulchella* (Proc. U. S. nat. mus., 1890, v. 12, 60-61, pl. 1, fig. 10) of which he has considerately sent me the female type for examination, belongs in this genus; the other species has not before been described.

ACROCARA MACULIPENNE.

Pedioscirtetes maculipennis Bruner, Ms.

Dull brownish olive green; head, thorax, and legs sparsely and thinly pilose. Head dull shining silvery white with a faint greenish tinge; two obliquely vertical pale green bands pass downward and more or less backward from below the eye and from the posterior margin of the same, the former fading and dispersed below; vertex with a similar broad median band, merging into dark brown anteriorly; frontal carina luteous, the sulcus infumated below and more or less greenish. Antennae blackish brown, the apical and basal joints and the inner side of the impunctate joints reddish luteous. Prothorax with the dorsum olivaceo-fuscous, both front and hind margins and lateral carinae rather broadly ferrugineo-testaceous, the latter sometimes becoming pallid on the prozona; lateral lobes with varying shades of brown and olivaceous, the whole margin testaceous, the prozona with inferior and median pallid longitudinal stripes of varying width. Tegmina mottled with light and dark brown, the former prevailing on the basal, the latter on the apical half, arranged on the basal half in transverse, irregular, on the apical half in subparallel, oblique blotches and bars. Wings blackish fuliginous with a slight olivaceous tint, glistening and with purplish reflections, the extreme base like the basal half of the dorsum of the abdomen bronze green, the extreme tip narrowly margined with sordid white, the veins everywhere black and in the anal area narrowly margined with pallid. Hind femora with two strongly oblique, rather broad pale bars; hind femora dull luteous, obscurely banded with fuscous in the middle, next the base, and at the apex, the apical half of the spines black. Other legs obscure

fuscous, often with a greenish tinge, with the basal half of the femora paler.

Length of body (♂) 27.5 mm., (♀) 35 mm.; tip of head to tip of closed tegmina 36 mm.; of tegmina (♂) 27 mm., (♀) 29 mm; of hind femora (♂) 16.5 mm., (♀) 18 mm.; of antennae (♂) 21 mm., (♀) 15 mm.

Two ♂. Montelovez, Cohahuila, Mexico, September 20 (E. Palmer); one ♀, Lerdo, Mexico, November (L. Bruner).

The succeeding genus has a still more Tryxaline appearance, due principally to its more oblique face, which shows on a side view but little concavity below the fronto-vertical process. Whether it belongs in the *tryxalidae* or not, its close alliance to the preceding forms cannot be doubted. It has already been described, but insufficiently, by Thomas, who placed it with the *tryxalidae*, and it is here recharacterized.

Pedioscirtetes Thomas.

Thomas wrote the name *Pedioscertetes*, but this is incorrect, as it is plainly derived from σκιρταω.

Body slender, feebly fusiform. Head of the same general form as in *Acrocara*, but with the vertex nearly horizontal, the process barely ascendant, the process separated from the vertex by a distinct but not deep transverse arcuate sulcation striking the anterior border of the eyes; the vertex is gently convex transversely, the process slightly tumid above; frontal costa much as in *Acrocara*, but with a shallower sulcus which terminates above where the costa, over a brief space, becomes compressed to a thick lamina, and with a broader and more regular divergence at base; lateral carinae as in *Acrocara*, as also the fastigia and lateral ocelli. Eyes small, not very prominent, about two thirds as long as the infraocular portion of the genae. Antennae (now broken in the only specimen seen) said by Thomas to extend "about one fourth their length beyond the pronotum," linear, and cylindrical except that six or seven joints beyond the second are slightly depressed and shorter than the succeeding punctate joints without gaining noticeably in breadth.

Pronotum tapering gently forward, more conspicuously on the metazona than on the prozona, the former very slightly ascending posteriorly, the dorsum of the prozona broadly convex transversely, that of the metazona nearly plane; median carina slight, slightest on the prozona, subobsolete between the sulci of the same, the two sulci of the prozona faint but complete; hind margin of metazona very obtusely angulate, the angle rounded, the lateral carinae much as in *Acrocara*; lateral lobes much as there with the anterior border slightly sinuate; metasternal lobes almost as far apart in the ♀ as the mesosternal. Termina slender, subcoriaceous on basal third only, where they are densely reticulate, normally supplied with spurious veins, the vena intercalata only indicated in the middle of its normal course, the vena media and vena discoidalis both furcate, the vena axillaris impinging on the vena analis. Radiate veins of wings normal. Hind femora longer than the abdomen; spurs and hind tarsi as in *Acrocara*.

Only a single species is known, *P. nevadensis* Thom., from Nevada, one of the type-specimens of which has been obligingly sent me for examination by Dr. Riley. The wing is not well described by Thomas, nor well figured by Glover, and in the specimen seen is not fully spread, so as to render a good description impossible in its present condition. It may be said, however, that the band is fusco-fuliginous, broader

than figured by Glover, becomes obscure and paler toward the costal margin, where it is traversed by pallid cross-veins, and has the interior margin at this point limited by the divarication of the discoidal vein.

The fourth genus, *Machaerocera* Saussure, is a common form in Mexico, and need not detain us here. It shows no elevation of the metazona whatever.

The fifth genus of the table is founded upon a species from Peru, which I formerly described as a *Machaerocera*, but which must be separated from it, its distinctive features being shown in the previous table. It may be called

PERUVIA gen. nov.

Body slender, subequal, compressed. Head moderately stout, trigonal. Vertex, including fastigium, gently and regularly convex, both longitudinally and transversely, with a distinct and equal median carina its entire length; triangular fastigium advanced in front of the eyes as far as their separation, the converging sides margined, the tip rounded; front considerably and almost uniformly declivent, faintly convex in front of the antennae, forming above a right angle with the vertex; frontal costa moderately broad, slightly expanding at the antennae, with subparallel sides, a little divergent below, with a broad and deep sulcus; lateral carinae prominent, parallel in upper half, considerably divergent in the lower; lateral ocelli next the eyes separated from them by their own width at the termination of the lower edge of the carinate margin of the fastigium of the vertex. Eyes semiglobular, prominent, equal, or perhaps a little more than equal, in width to the infraocular portion of the genae; beneath the middle of the eyes a short vertical carina which fades before reaching them. Antennae moderately slender, the six joints beyond the second depressed (beyond broken).

Prothorax compressed with parallel sides, the dorsum plano-subtectiform, with a strong subequal median carina throughout; prozona fully as long as the metazona, with parallel, slight, irregular, lateral carinae which are not far removed from the middle of either side; it is traversed by two straight transverse sulci which cut the carinae, but the anterior of which does not extend upon the lateral lobes, being supplanted by another in advance of it; metazona with scarcely more than should dered lateral canthi, its posterior margin angulate at a little more than a right angle; lateral lobes with normal sulci, the anterior and posterior margins subparallel, the lower posterior angle rectangulate but with a slight posterior lobe, the lower margin horizontal in its posterior half and anterior fourth, the second fourth oblique exposing the pleural plate, which shows a small descending lobe at its anterior end. Metasternal lobes of female only a little more than half as distant as the mesosternal, marked inwardly by two profound pits. Tegmina moderately slender, the anterior margin with a distinct lobe at the end of the basal fourth, subcoriaceous throughout but nowhere closely reticulate except at the extreme base and on the costal and anal margins; no intercalary vein; ulnar vein approaching the median and widely separated from the posterior ulnar; median vein simple, axillary vein impinging on the anal. Wings with humeral field very broadly scalariform, the radiate veins below normal.

The single species known to me is *P. nigromarginata* from the Peruvian Andes, described by me (Proc. Bost. soc. nat. hist. 1875, v. 17, p. 268) as a species of *Machaerocera*. It is of small size.

The last genus in this division of the *acrolophitinae* is founded upon a single female specimen, not in the most satisfactory condition, from California.

GYMNES (γυμνής*) gen. nov.

Body rather slender, compressed. Head relatively rather large; no broader beneath than above, as a whole nearly twice as high as broad, when viewed in front; vertex gently convex, transversely and longitudinally, the curve of the latter terminating at the front edge of the eyes, in front of which the fastigium is horizontal; the latter deeply and broadly sulcate with distinct bounding walls which are parallel on the hinder, convergent on the front half, the front strongly rounded; a median carina runs through the entire length of the fastigium, most distinct on the anterior half; face subdeclivent, more strongly in front of the eyes than below, the upper part of the frontal costa forming with the fastigium of the vertex less than a right angle; frontal costa rather narrow, pinched at extreme summit to a mere lamina, below subequal, slightly contracted immediately below the ocellus, slightly sulcate throughout except on the lamina; lateral carina straight, sharp, regularly divergent, extending to the edges of the clypeus; lateral ocelli situated midway between the antennae and the upper corner of the eyes, the fastigia facing more outward than downward or forward. Eyes twice as high as broad, considerably longer than the infraocular portion of the genae. Antennae very short, only as long as the head and half the pronotum, moderately stout, all the joints beyond the second excepting the apical equal, pretty strongly depressed, punctate, the apical joint half as broad, bluntly conical.

Prothorax with the prozona and metazona of subequal length, the former of equal width, rounded subtectiform transversely, the latter tumid and tapering forward considerably; median carina slight but distinct throughout, somewhat subdued on the posterior half of the prozona; lateral carinae on the metazona only terminating at the normal sulcus; two slight but continuous and gently sinuate transverse sulci on the prozona, the anterior not passing into the lateral lobes; these have the anterior and posterior margins straight, slightly convergent, the lower posterior angle rectangulate but rounded, the lower margin horizontal, barely inclined upwards anteriorly, so that the plate below is scarcely at all exposed. Metasternal lobes transversely quadrate, scarcely nearer together than the mesosternal lobes (♀). Tegmina slender, slightly tapering, scarcely coriaceous excepting at the extreme base where only the reticulation is at all dense, being elsewhere very open. Mediastinal area almost entirely free from cross nervures or reticulation of any kind except apically; intercalary vein present, discoidal vein unbranched, axillary vein impinging on the anal. Wings not large, simple and normal. Hind legs long and slender, the superior and inferior carinae of the femora well developed; hind tibiae with a dozen spines in the exterior row; calcaria moderately long; basal joint of hind tarsi not more than twice as long as second.

A single species is at hand.

GYMNES PUNCTATUS sp. nov.

Pallid, apparently yellowish green in life. Almost entirely immaculate, the only dark markings of the body being the obscure brownish fuscous median carina of the pronotum, and the blackish fuscous posterior third of the metazona. Tegmina with six or eight small, roundish, brownish fuscous spots arranged by pairs transversely at tolerably regular intervals beginning at the middle of the basal half. Wings very delicate, translucent. Hind femora with slight narrow infuscations beyond the middle and at tip; spines of hind tibiae black-tipped.

The surface is generally nearly smooth, and a little lustrous on the pronotum which is also feebly and rather delicately punctate especially on the metazona, the lateral lobes being quite smooth on the prozona; the sides of the head are also feebly subrugose but

* In allusion to the very short subensiform antennae.

none the less shining, and the lower part of the face is slightly punctate.

Length of body 17 mm.; including closed tegmina 21 mm.; of antennae, 4.5 mm; tegmina 15.5 mm; hind femora 12 mm.

Unfortunately I have but a single specimen, the colors bleached from immersion in alcohol. It is a ♀ and was taken at Tighes, California, I believe during one of the explorations under Capt. Wheeler.

There remain the genera of the other division of *acrolophitinae* which by their gross form, hollowed dorsum of the metazona, long hind tarsi, and short frontal costa, are widely separated from the genera we have considered. Of these I know *Daemonea* only from Saussure's description, and can only refer thereto, but of

HIPPACRIS Scudder,

established on a Peruvian insect, I have before me two species closely resembling each other and yet widely distinct, which may be distinguished as follows:—

Antennae (of ♀ at least) nearly or quite half as long again as head and pronotum together, tapering regularly; tegmina relatively slender, being fully four times as long as broad; plates of the ovipositor of normal form ..... *crassa.*

Antennae (of ♀ at least) apparently not much longer than head and pronotum together, several neighboring joints in two groups near the middle enlarged and depressed, forming broader areas; tegmina relatively stout, being less than three times as long as broad; plates of the ovipositor reduced to simple, straight, tapering, compressed laminae without armature *picticornis.*

To the first species, *H. crassa*, described by me (Proc. Bost. soc. nat. hist., 1875, v. 17, p. 268) from the eastern slope of the Peruvian Andes, I have nothing to add, as the single female then seen is still the only one known to me. The other from the opposite side of the Andes may be called

HIPPACRIS PICTICORNIS sp. nov.

Nearly uniform dull leaf brown. Head punctate, but obscurely excepting on the lower half. Antennae brownish luteous, with the first and second, ninth and tenth, thirteenth to sixteenth and most of seventeenth joints black, the basal joint brownish luteous on the inner upper surface, the ninth and succeeding joints punctate and of these the black joints depressed and wider than the others. Pronotum with the crested lateral carinae of the prozona and the hinder edge margined with black, and just above the posterior lower angle of the lateral lobes a small round luteous spot margined with blackish. Tegmina with all the longitudinal veins, except in the apical fourth, luteous. Wings faint fuliginous, all the veins blackish fuscous, and a blackish fuliginous cloud along the edges of the tip. Hind femora blackish at extremity on the outer side; hind tibiae luteo-fuscous, the spines dull luteous, black-tipped, the tarsi dull luteous.

Length of body 31 mm.; including closed tegmina 36 mm.; of antennae (broken beyond 19th joint) 17 mm.; of tegmina 26 mm.; width of same in middle 10 mm.; hind femora 15.5 mm.; tibiae 13 mm.; tarsi 8 mm.

Upper Amazons, Brazil. One ♀.

The most remarkable thing about this species is the manner in which it differs from the other species and indeed from all *acridiodea* I have examined in the structure of the ovipositor. Normally,

as is well known, these parts are principally composed of an upper and a lower pair of oppositely curved, stout, falcate hooks, serving as scrapers, working in opposite directions in boring or rather scratching a vertical hole in the earth in which to deposit eggs. Plainly the oviposition of this creature must be something quite different and very likely analogous to that of the *locustodea*, for these hooks or scrapers are reduced to a couple of sets of straight, compressed, tapering, bluntly pointed laminae, entirely without serrations or armature of any kind, and attingent only at tip, the upper pair the larger. They would appear to be useful only in crowding eggs into already existing crevices of wood or bark. Such a difference in sexual armor between two closely allied species I have never before seen.

Another point of interest in the species is the somewhat unusual contrasts of color and somewhat vivid color, especially in the antennae, in an insect which otherwise by its monochrome of dead leaf brown would seem to be gaining defence by avoiding vividness and contrast. Such are some of the anomalies in nature.

Lowne's Anatomy of the Blow-fly.

The first part of Lowne's Anatomy, Morphology and Development of the Blow-fly has just appeared. The prospectus announced five quarterly parts each with about 64 pages of letterpress four plates and some 20 original drawings. As usual, however, the first part runs beyond anticipations, containing 98 pages. The introductory matter of 31 pages gives a life history of Calliphora, an introduction to insect anatomy in general and the broad characteristics of the Diptera and its subdivisions; while the body of the part is given up to the anatomy of the larva; half a dozen brief topical bibliographies are scattered through the Part and a brief appendix gives methods for histological work.

Hydrocyanic Acid Secreted by Polydesmus virginiensis, Drury.

Guldensteeden-Egeling has shown (Pflüger's Archiv f. d. ges. physiol., 1882, v. 28) that *Paradesmus* (*Fontaria*) *gracilis*, Koch, a myriopod indigenous to the Fiji Islands, Moluccas, etc., but which has now become acclimatized in some of the hot-houses of Europe, produces a secretion that contains besides benzaldehyd free hydrocyanic acid. In the same year Weber (Archiv f. mikr. anat., v. 21.) showed that the repugnatory glands which produce the secretion open near the median dorsal line on certain segments and that it is only from these segments tha the characteristic odor of prussic acid is diffused. Haase in a recent note, from which I have taken these bibliographical references, has again called attention to this curious secretion. (Sitzungs b. d. Gesell. naturf. Freunde zu Berlin, Jahrgang 1889, p. 97.)

While collecting specimens of our native *Polydesmus* (*Fontaria*) *virginiensis*, a myriopod not uncommon in some parts of Wisconsin and probably in many of the middle states, I observed that when roughly handled they emitted an odor like bruised peach-leaves or cyanide of potassium. Suspecting the presence of a secretion like that of the Moluccan species, I requested a professional chemist, Mr. Davenport Fisher of Milwaukee, to test the myriopods for free hydrocyanic acid. Mr. Fisher succeeded in establishing the presence of a small quantity of the highly poisonous substance. Subsequently I found it easy to make the test for myself. A few of the *polydesmi* were ground up in a mortar with a small quantity of water A few drops of potassium hydrate and ferrous sulphate were then added to the solution obtained by filtering the mass. On the application of gentle heat and the further addition of a little ferric chloride with sufficient hydrochloric acid to dissolve the precipitated ferrous and ferric hydrates, the faint but distinct tinge of Prussian blue attested the presence of free hydrocyanic acid.

W. M. Wheeler.

INDEX.

A. A. A. S., meeting of, 58, 363.
Abbot, John, 143.
Acantherpestes, 288.
Acari, 18.
Achalarus lycidas, 277.
Acilius, 163.
Aciphus singularis, 56.
Acocephalus mixta, 390. vitellinus, 390.
Acraspis erinacei, 186, 218, 221. villosus, 218, 221.
Acrididae, 46, 271, 432.
Acridiodea, 431, 441.
Acridium, 270, 271.
Acrocara, 433, 436, 437, 438. maculipenne, 437. pulchellum, 437.
Acrocera fasciata, 404.
Acroceridae, 101, 404.
Acrolophitinae, 432, 433, 439, 441.
Acrolophitus, 432, 433, 434, 435, 436, 437. hirtipes, 435.
Acronycta alni, 363. populi, 173.
Acrosoma spinea, 147.
Actobius, 93.
Acutalis calva, 389. dorsalis, 391. semicrema, 389. tartarea, 389.
Adalia frigida, 232.
Adelocera brevicornis, 233.
Adephaga, 282.
Adimonia externa, 234.
Admestina, 143.
Aeaea, 21.
Aegeria impropria, 143. sp., 28[illegible]
Aegialia, 92.
Aeschna borealis, 355. heros, 223. janata, 354. minor, 354. septentrionalis, 354, 355. sitchensis, 353, 355. yamaskanensis, 367.
Aetia, 21.
Agabus taeniolatus, 232.
Agaleca naevia, 72.
Agallia novellus, 389.
Aganisthos acherontr, 168.
Aglais milberti, 275.
Agrilus otiosus, 233.
Agrion colchicius, 242.
Agrionina, 241.
Agrotis, 405. fennica, 19, 20. incivis, 421. segetum, 10. sp., 46.
Alebra, 75, 212, 213. albostriella, 76. aurea, 213. binotata, 213. pallida, 213.
Alęochara bimaculata, 232.
Aletia sp., 17, 18, 144, 173.
Amaurobius sylvestris, 404.
Amblycephalus curtisii, 390. melsheimeri, 391. sayi, 390.
Amblycorypha oblongifolia, 69. rotundifolia, 69.
Amblyscirtes samoset, 278. vialis, 278.
Ampelophaga myron, 400.
Amphibolips coccinea, 182, 184, 221. cookii, 220, 221. inanis, 184, 186, 220, 221. nubilipennis, 221. prunus, 184, 221. sculpta, 184, 221. spongifica, 184, 221.
Amphicerus bicaudatus, 117, 142, 233.
Amphion, 397.
Amphiscepa bivittata, 389.
Amphizoa insolens, 282. lecontei, 282.
Anabrus simplex, 198.
Anarsia, 21.
Anarta, 405. sp., 58.
Anasa sp., 18.
Anax amazili, 305, 307, 308. concolor, 304, 305. junius, 305, 306, 307. longipes, 303, 304, 305, 307. maculatus, 307. spiniferus, 305. strenuus, 306. validus, 306, 307. walsinghami, 306, 307.
Anchastus, 92.
Ancylogaster armatus, 20.
Ancyloxipha numitor, 278.
Andrenosoma, 255.
Andricus clavula, 184. cornigera, 185. flocci, 185, 221. foliaformis, 214, 221. futilis, 185, 221. petiolicola, 186, 221. punctatus, 185. scitulus, 185. seminator, 185. singularis, 186, 221.
Androconia, 139.
Anesychia, 21.
Anisolabis maritima, 379.
Anisomorpha buprestoides, 200.
Anisophia sp., 9.
Anisota senatoria, 137.
Anomala, 93. binotata, 233. undulata, 233.
Anomia, 212, 213. quercus, 212.
Anomoea laticlavia, 234.
Anoplotrupes, 104, 105, 109.
Anosia, 192. plexippus, 63, 92, 192, 276, 402.
Anotia burnetii, 388. robertsonii 388. westwoodi, 388.
Ant domiciles on plants, 175.
Ant inhabited plants, 71.
Antheraea mylitta, 28, 29.
Anthicus floralis, 34.
Anthocharis pima, 141. sp., 9.
Anthomaster leonardus, 278.
Anthonomus prunicida, 142.
Anthracomartus, 288.
Anthrenus, color preference in, 59. scrophulariae, 59, 115, 140.
Anthribus cornutus, 117.
Antirrhaea archaea, 33.
Apanteles crambi, 51.
Apatela americana, 142.
Apatelodes torrefacta, 148.
Aphamartania, 256.
Aphantotimus, 337, 375, 376. fraterculus, 337, 376. willistoni, 337, 376, 377.
Aphestia, 257.
Aphid structures, 409.
Aphidae, 154, 282.
Aphides, swarming, 23.
Aphididae, 22, 92, 123, 154, 208, 409. food-plants, 59.
Aphis brassicae, 411, 414. corni, 10. cornifoliae, 123. cucumeris, 411, 414. forbesi, 273. maidis, 273. persicae-niger, 412, 414. rose, 141. rudbeckiae, 127. rumicis, 10. salicicola, 209. salicti, 208. sp., 47, 125.
Aphnaeus argenteola, 430. argyrocyclus, 431. crustaria, 430. ilogo, 429. orcas, 429, 431.
Aphodiini, 92.
Aphodius, 92. pumilus, 282.
Aphrophora bilineata, 388. parallela, 388. quadrinotata, 388. saratogensis, 300. signoreti, 390.
Apiocera, 100, 101, 102. haruspex, 101.
Apioceridae, 101, 102.
Apion herculaneum, 234. sp., 9.
Apis mellifica, 21. 58, 119.
Aporia crataegi, 406.
Apple maggot, 405.
Aptopus, 92.
Arachnida, 118.
Arachnis, 353.
Aramigus fulleri, 118.

Araneae, 118.
Araneina, 57.
Arboreal auscultation, 58.
Archasia galeata, 390.
Archilestes, 259.
Archilestris, 259. capnopterus, 259. magnificus, 259.
Archipolypoda, 290, 293.
Arctia caja, 94. virgo, 57.
Areus, 91.
Argiope riparia, 147.
Argynnides of North America, 308, 328.
Argynnis, 348. adiante, 315, 316, 329. adippe, 309. alcestis, 310, 312, 406. aphrodite, 275, 309, 310, 311, 312, 313, 314, 329. arge, 316. artonis, 316. atlantis, 275, 309, 311, 312, 313, 314, 315. bellona, 309. bischoffi, 316. bremneri, 315, 316. callippe, 312, 314, 315. carpenteri, 311. chitone, 314. cleodoxa, 309. clio, 316. columbia, 313. coronis, 312, 314, 315, 329. cybele, 275, 309, 310, 311, 312, 313, 314. cypris, 310. diana, 309. edwardsii, 312, 314. egleis, 316, 317. electa, 313. erinna, 316. eris, 309. eurynome, 308, 316, 317. freya, 46. frigga, 46. halcyone, 310, 312. hesperis, 313, 315. hippolyta, 315. idalia, 70, 93, 309. lais, 314. laura, 314. leto, 310, 311. liliana, 308, 314, 315, 329. macaria, 314. media, 308, 314. monticola, 308, 309, 315, 316, 317, 329. montinus, 309. monrivaga, 316, 317, 329. myrina, 309. nausicaa, 312. nevadensis, 314. niobe, 309. nitocris, 310, 311. nokomis, 310, 311, 312, 329. opis, 316. rhodope, 315. rupestris, 329. sagana, 309. semiramis, 315, 329. zerene, 309, 315, 316, 329.
Arsenical insecticides, 142, 143.
Arthromacra aenea, 58.
Arzama obliquata, 140.
Asconema gibbosum, 14.
Asilidae, 101, 102, 255.
Asilinae, 100, 258.
Asilus, 119.
Asphondylia helianthi-globulus, 102. monacha, 102, 103. rudbeckiae, 102.
Astatus pictus, 142. strigosus, 142.
Astomella lindenii, 404.
Ataenius, 92.
Atalopedes huron, 278.
Athysanus, 75. abietis, 390. curtisii, 390. fagi, 390. fenestratus, 390. minor, 390. nigrinasi, 390. simimudus, 389. striola, 240. variabilis, 390.
Atomosia, 257, 258.
Atonia, 257. ancylocera, 257. mikii, 257, 258.
Atractia, 258.
Atrytone logan, 278. zabulon, 278.
Attacus, 59. atlas, 28. cecropia, 29, 135, 155. cynthia, 118. luna, 118, 135, 154. pernyi, 5. polyphemus, 135. promethea, 155.
Attagenus megatoma, 283.
Attelabus bipustulatus, 234.
Attidae, 117, 143.
Atymna inornata, 389, 390. querci, 390.
Auditory organs, 141.
Aulacizes novaeboracensis, 390.

Bactridium striolatum, 232.
Bait for insects, 92.
Balaninus, vitality of larvae, 48.
Banchus, 405.
Baris umbilicata, 234.
Basilarchia, 79. archippus, 274. arthemis, 275. astyanax, 275.
Bassareus luteipennis, 234. mamnifer, 234.
Bee enemy, 119.
Bees in the mails, 95.
Beetles, collecting, 155.
Belostoma americanum, 150.
Bermuda, insects of, 317.
Biologia Centrali-Americana, 93.
Biorhiza forticornis, 186, 221. macrocarpae, 221. rubinus, 215, 221.
Blapstinus metallicus, 234.
Blatta americana, 135. orientalis, 34. sp., 46, 197.
Blattinariae, 290.
Blepharepium, 256.
Blepharocera yosemite, 34, 117.
Blepharoceridae, 33, 34, 46, 117.
Blethisa quadricollis, 231.
Blissus leucopterus, 18, 19, 110.
Blow-fly, Lowne's anatomy of, 442.
Boarmia, 141.
Boletobius exoletus, 232.
Bombus, 34. gerstaeckeri, 21. opulentus, 21. sp., 142, 154, 159.
Bombycidae, 9, 22, 53, 118.
Bombylidae, 100.
Bombyx mori, 155. neustria, 6.
Boreus, 159, 160, 161, 163, 164, 194. californicus, 160, 162, 164.
Bot-fly parasite of box turtle, supposed, 403.
Bothrideres, 293.
Botys insequalis, 52. langdonalis, 22.
Box-elder cecidomyiid, 392.
Box-turtle parasite, 403.
Brachyacantha ursina, 232.
Brachycrepis, 140.
Brachylobus lithophilus, 232.
Brachynus lateralis, 232. minutus, 232. perplexus, 232.
Brachypremna, 117.
Brachys aeruginosa, 233.
Brachystoma sp., 56.
Braconidae, 116.
Brenthis, 309. bellona, 275. montinus, 275. myrina, 275.
Breyeria, 118.
British orthoptera, 379.
Brodia, 289.
Bruchidae, 93.
Bruchomorpha dorsata, 388.
Bruchus nigrinus, 234.
Bupalus piniarius, 92.
Buprestis maculiventris, 226. sp., 9.
Butterflies, cosmopolitan, 190. Edwards's, 406. food plants of American, 274. meconium of, 170. mimetic coloration of pupae of, 48. odorous, 35. Scudder's, 120, 363. southern distribution of some, 347.
Butterfly, 94.
Byrsocrypta ulmicola, 154.
Bythoscopidae, 75.
Bythoscopus fagi, 390. fenestratus, 390. minor, 390. nigrinasi, 390. strobi, 390. tergatus, 390. unicolor, 390. variabilis, 390.

Cabbage louse, 411.
Cacoecia rosaceana, 52.
Cafius, 93.
Calandra remotepunctata, 235.
Calathus sp., 9.
Calephelis borealis, 276.
Callicerus sp., 232.
Callidryades, 192.
Callidryas eubule, 276. philea, 228.
Calliphora, 442.
Callipterus discolor, 131.
Callirhytis clavula, 221. cornigera, 221. futilis, 221, 235. punctatus, 221. radicis, 237. scitulus, 221. seminator, 221.
Callosamia angulifera, 260, 261. promethea, 22, 29, 260, 261, 280, 420.
Caloptenus differentialis, 19.
Calopteron, 58. terminale, 233.
Calopterygina, 241.
Calopteryx, 241. aequabilis, 246, 247, 248, 249, 250. amata, 244, 250. angustipennis, 242, 244, 250. apicalis, 246, 250. atrata, 242. cognata, 245. cornelia, 242. dimidiata, 245, 246, 250. elegans, 242, 243, 244. grandaeva, 242. haemorhoidalis, 242. holosericea, 249. hudsonica, 247, 248, 249. maculata, 249, 250. materna, 249. opaca, 249. orientalis,

242. papilionacea, 249. splendens, 242, 250. syriaca, 242, 245. virgo, 242, 243, 247, 249. yakima, 248, 249. sp., 223.
Calosoma calidum, 117, 150, 228. externum, 150. scrutator, 149, 150. willcoxi, 149, 150.
Calotermes flavicollis, 250, 255.
Calpodes ethlius, 278.
Calymnia aequilinea, 58.
Cambridge entomological club, proceedings, 44, 55, 69, 138, 153, 282.
Cammula pellucida, 197.
Camponotus inflatus, 32. pennsylvanicus, 46.
Campylenchia curvata, 389.
Campylus denticornis, 227.
Canadian lepidoptera, additions to, 142.
Cantharis vesicatoria, 115.
Canthon laevis, 135, 233.
Canthotrupes, 105.
Carabidae, 9, 93, 224.
Carabus auronitens, 23, 31.
Cardiophorus gagates, 233. tenebrosus, 233.
Carpocapsa dehaisiana, 380. pomonella, 92. saltitans, 380.
Carpophilus corticinus, 232.
Carteria mexicana, 168.
Carynota, 391. marmorata, 389. mera, 389.
Cassida sp., 69.
Catadysas, 22.
Catadysoides, 22.
Caterpillar fungus, 15, 17, 20.
Caterpillars, diseased, 15, 19, 20.
Catesby, Marc, 134.
Catocala innubens, 154.
Catopsilia gnoma, 35.
Cecidomyia destructor, 39, 115, 116, 117, 118, 141, 155. negundinis, 392. pini, 14. salicis-strobiloides, 284, sp., 324.
Cecidomyidae, 99, 100.
Cecrita guttivitta, 53.
Celithemis amanda, 384. anna, 383. balteata, 383. elisa, 383. eponina, 383. fasciata, 383. ornata, 383, 384, superba, 384.
Cells, study of, 77.
Centistes americana, 189.
Centrinus capillatus, 234.
Centrotus acuminatus, 391.
Cerambycidae, 93.
Cera hosia tricolor, 141, 143.
Ceratocampa imperialis, 28, 118.
Cercopis bicincta, 388. obtusa, 388. parallela, 388. quadrangularis, 388.
Cercyonis alope, 274. nephele, 274.
Ceresa brevicornis, 388. diceros, 389. taurina, 388.
Cerocoma schreberi, 115.
Ceroptres petiolicola, 184, 185, 186, 221. sp., 221.
Cerotainia, 257, 258.
Cerura multiscripta, 393.
Ceuthophilus, 140, 199, 271. maculatus, 198.
Ceutorhynchus septentrionalis, 234.
Chaerocampa, 397.
Chaitophorus smithiae, 133. viminalis, 133.
Chalcidae, 138.
Chalcididae, 159.
Chalcidinae, 140.
Chalcoparia, 22.
Chalcophora liberta, 233. virginiensis, 228.
Chalepus trachypygus, 233.
Championella, 93.
Chapel Hill, N. C., butterflies of, 140.
Charidryas nycteis, 275.
Chariessa pilosa, 233.
Charitopus magnificus, 117.
Chauliodes maculatus, 224.
Chauliognathus sp., 18.
Chelifer sp. 33.
Chelonus antillarum, 116. nitens, 116.
Chemically-produced varieties of coleoptera, 23, 31.
Cherry aphis, 412.
Chinch bug diseases, 110.
Chionobas semidea, 69.
Chironomus plumosus, 44. sp., 10, 44.
Chiropachides, 140.
Chlaenius circumcinctus, 232. laticollis, 232. nemoralis, 232. tomentosus, 227.
Chloealtis conspersa, 272.
Chloria, 212. pura, 212. viridula, 212.
Chlorippe clyton, 274.
Chlorita, 212.
Chloroneura, 212.
Cholomyia inaequipes, 20.
Chrysobothris femorata, 142, 295.
Chrysodina, 22.
Chrysomela decemlineata, 118.
Chrysomelidae, 55.
Chrysopa sp., 224.
Chrysophanus dispar, 406. hypophlaeas, 347, 348. thoe, 276.
Chrysorimus, 337, 338, 375, 376. molliculus, 375. pusio, 374.
Chrysotus, 376. affinis, 358. choricus, 357. obliquus, 358. pallipes, 357. picticornis, 358, 359. pratin ola, 357. subcostatus, 357. wisconsinensis, 356, 357.
Cicada, 67, 75, 211. albipennis, 68. auletes, 68. aurata, 211. aurifera, 68, 388. bicostata, 68. canicularis, 39, 68. dorsata, 67, 68, 388, 390. hieroglyphica, 388. lyricen, 68. marginata, 67, 68, 388. opercularis, 68. parvula, 388. periodical, 45. picta, 211, pruinosa, 68, 388. quercus, 211. resh, 68. rimosa, 389. robertsoni, 68, 390. septemdecim, 15, 17. superba, 68, 388. synodica, 389. tibicen, 67, 68, 389, 391. urticae, 211. vitripennis, 388. vittata, 211. sp. 9, 10, 18.
Cicadidae, 67, 387.
Cicadula, 75, 76 211, 212. alpina, 76. citrinella, 76. dahlborni, 76. decimpunctata, 76. elegantula, 76. germari, 76. gracilis, 76. lineatella, 76. maculipes, 76. micantulus, 76, pulchella, 76 punctata, 76. quadrinotata, 76. quadripunctata, 76. rosae, 76. septemnotata, 76. sexnotata, 76, 240. sexpunctata, 76. smaragdula, 76, spretus, 76. strigipes, 76. sulphurella, 76. urticae, 76. vittata, 76.
Cicindela hirticollis, 228. patruela, 231. punctulata, 231. sexguttata, 231.
Cidaria vittata, 151.
Cimex lectularius, 59.
Cincinnati: coleoptera, 21. fauna, 22.
Cinclidia harrisii, 275.
Cis chevrolatii 233.
Cissia eurytus, 274.
Cixius cinctifrons, 388. coloepium, 388. impunctatus, 390. pini, 241, 388, stigmata, 389. stigmaticus, 241.
Cladobius, 133.
Classification, 116.
Clastopera obtusa, 388. pini, 388. proteus, 388. testacea, 388.
Cleonus sp. 9, 12.
Clerus nigripes, 226.
Clinidium, 165, 166. calcaratum, 165, 166. sculptile, 165, 166.
Clisiocampa americana, 421. sylvatica, 16, 17, 20.
Clubiona putris, 404.
Cnemotrupes, 105, 110.
Cobwebs, photographs of, 71.
Coccidae, 9, 10, 115, 116, 118, 144, 153.
Coccinellidae. 9, 23, 56, 70, 92, 138.
Coccotrypes jalappae, 235.
Coccus hesperidum, 5.
Coelodasys biguttatus, 53. cinereofrons, 53. edmandsi, 53. harrisii, 53.
Coleoptera, chemically produced, 23, 31. of Cincinnati, 21. deformed, 34. of the lower peninsula of Michigan, 231. reproduction of lost limbs in, 138.

Colias, 22, 32. ariadne, 334. cnesonia, 334. eurytheme, 284, 328, 334. intermedia, 284. keewaydin, 334. philodice, 334.
Collecting: apparatus, 143. beetles, 155. coleoptera, 140. hymenoptera, 143.
Collections, value of, 72, 115, 116, 118.
Colletes sp., 115.
Colopha, 154.
Color, can insects distinguish, 140. preference in Anthrenus, 59.
Coloradia, 327.
Colorado biological association, 200, 228, 283.
Colorado, fauna of, 115. potato beetle, 47.
Coloration, 31, 94. of cocoons and pupae, 60.
Colpocephalum, 34.
Colpolopha, 432.
Conopsus, 212. albostriellis, 212. discicollis, 212. elegantula, 212.
Conipoda, 435.
Conocephalus, 271, 272. acuminatus, 283. ensiger, 199.
Conotrachelus nenuphar, 95.
Consanguinity in lepidoptera, 150.
Contagious insect diseases, 3, 20.
Cordulia lintneri, 248, 371, 405. molesta, 369. uhleri, 373.
Cordulina, descriptions of, 366.
Corn delphacid, 321.
Corphyra collaris, 234.
Corticaria deleta, 20. elongata, 20. fenestralis, 20. fulva, 20. grossa, 20. pubescens, 20. pumila, 20. serrata, 20. villosa, 232.
Corydalis cornutus, 224.
Corydaloides, 289.
Corymbiteshieroglyphicus, 227.
Coscinoptera dominicana, 234.
Cosmopolitan butterflies, 190.
Cossonus platalea, 235.
Crambus exsiccatus, 51.
Cremastogaster lineolaris, 321. sp., 175, 176.
Cressonia juglandis, 264.
Cricket, wasp and, 155.
Crocallis dardoinaria, 151.
Croesus latitarsus, 41. septentrionalis, 42.
Cryptobium, 93. anceps, 93. arizonense, 93. carolinum, 93. lecontei, 93. nactum, 93. propernum, 93. vagum, 93. ventrale, 93. vitatum, 93.
Cryptocephalus insertus, 234.
Cteniza ariana, 404. californicum, 22.
Cucujus, 56.
Culex, 414. sp., 10, 44.
Cupesidae, 282.
Curculio injury to cherries, 95.
Cyaniris pseudargiolus, 276.
Cybister fimbriolatus, 150. sp., 143.
Cylindrophora, 255.
Cyllene pictus, 225. robiniae, 225.
Cymatodera bicolor, 233. brunnea, 233.
Cymus angustatus, 27. claviculus, 240.
Cynipidae, 57, 183, 214.
Cynipidous gall-flies, life history, 235.
Cynips aciculata, 184. confluens, 184. dimorphus, 186, 221. ficus, 186. lana, 185. mamma, 216. nigricens, 217, 221. pisum, 186. strobilana, 186, 217, 221.
Cyphon variabilis, 233.
Cyphotomyia, 257. lynchii, 258.
Cyrtarachne multilineata, 154.
Cyrtocarenum californicum, 22.
Cyrtophyllus, 195. concavus, 198.
Cyrtosia fenestrata, 388. mutica, 389. trilineata, 389. vau, 389.

Daemonea, 431, 432, 433, 434, 435, 441.
Danais archippus, 33, 50, 92. erippus, 33. gilippus, 33. plexippus, 135. sp., 18.
Dasyglenes, 140.
Dasylabris, 34.
Dasyleptus, 289.
Dasypogon albitarsis, 259. capnopterus, 259. magnificus, 259.
Dasypogoninae, 256.
Datana augusii, 299. contracta, 418. drexelii, 414. 415, 416, 418, 421. floridana, 299, 401. integerrima, 300, 401, 421. major, 414, 415, 418, 419, 421. ministra, 12, 137. modesta, 299, 401. palmii, 299, 401, 415, 418, 421. perspicua, 421.
Debis portlandia, 348.
Decatoma flava, 186, 221. variana, 185, 187, 221. sp., 187, 221.
Decticus griseus, 5. verrucivorus, 46.
Deformed: coleoptera, 34. hemiptera, 34.
Deidamia inscriptum, 397, 400.
Deilephila, 396, 397.
Deiopeia bella, 135.
Delphacinae, 321.
Delphax, 28. arvensis, 390. dorsalis, 390. maidis, 321, 323. tricarinata, 389.
Deltocephalus, 75. abdominalis, 241. debilis, 341. inimicus, 389. melsheimeri, 390. sayi, 390.
Demodex folliculorum, 32.
Dendroctonus rufipennis, 224. terebrans, 235.
Denudation, 144.
Dermestes, 119. peruvianus, 152. pulcher, 232.
Deromyia, 256. misellus, 256.
Development theory, 94.
Dexiidae, 20.
Diabrotica vittata, 16, 225.
Diachus auratus, 234.
Diagrypnodes wakefieldii, 56.
Dianous, 91.
Diaphorus hoffmannseggii, 359. interruptus, 360. leucostomus, 360, 361. oculatus, 359. opacus, 360. palpiger, 360, rauterbergi, 360. sayrapa, 359, tripilus, 359.
Diastrophus radicum, 183, 221.
Diatraea, 141.
Dibelona, 140.
Dicerca prolongata, 140.
Dicraneura, 75, 211, 212, 213. abnormis, 213. carinata, 213. citrinella, 76. micantulus, 76.
Dictyna, 72.
Dictyoneura, 118, 290.
Didymops obsoleta, 369. transversa, 371.
Diedrocephala coccinea, 390. mollipes, 390. novaeboracensis, 390. versuta, 390.
Dimapate wrightii, 93.
Dinoderus densus, 233.
Diogmites, 256.
Diplax amanda, 383. elisa, 383. flavicosta, 386, 387. madida, 385, 386, 387. ornata, 383, 384. rubicundula, 385. sp., 223.
Diplochila impressicollis, 231. major, 150.
Dipterous parasite of spiders, 404
Diseases, bibliography of insect, 15, 45. contagious insect, 3. of insects, protozoan, 4.
Disonycha pennsylvanica, 234. punctigera, 234.
Diurnea fagella, 96.
Dolba hylaeus, 267.
Dolichopodidae, descriptions, 337, 355, 373.
Dolichopus, 337, 338, 375, 376. albiciliatus, 338. batillifer, 340. brevipennis, 339. flagellitenens, 339, 340. germanus, 341, 342, 345. henshawi, 340. incongruus, 338, 339. pachycnemus, 339. palastricus, 340. scoparius, 379. variabilis, 342, 343.
Dolichosoaptus artifex, 333. latastei, 333. vittatus, 333.
Doenacia cuprea, 234. emarginata, 234. flavipes, 234.
Doryclus, 256. distendens, 256

Doryphora 10-lineata, 17, 18, 115, 142. sp., 6, 18.
Douglassia, 32.
Dragon-fly, habit of, 364.
Drosophila, sp., 9, 19.
Dryininae, 324.
Dryocoetes affaber, 142.
Dryophanta papula, 187, 221.
Dryops, 364. fastigiatus, 232.
Dryopteris rosea, 421.
D'urbania ashira, 428. libentina, 428. mondo, 428. olombo, 429. osheba, 428.
Dytiscus, 55. fasciventris, 150. marginalis, 32. verticalis, 232. sp., 143, 227.

Eacles imperialis, 135.
Economic entomologists, notice of meeting, 406.
Economic entomology, 116.
Ecpantheria, 353. oculatissima, 135.
Edema albifrons, 421.
Edrionotus, 34.
Edwards's: bibliography of transformations, 401. butterflies, 406.
Elachista, 21, 32.
Elaphidion mucronatum, 283. villosum, 295.
Elater manipularis, 233.
Elateridae, 34, 92.
Electric light: captures, 149. lepidoptera attracted to, 32. Trox, at 169.
Eleodes obsoleta, 225.
Elephantomyia, 293.
Embia, 293.
Emesa longipes, 280.
Emphytus cinctus, 279.
Empidae, 99, 100.
Empis punctata, 57.
Empoa, 211, 213. coccinea, 390. querci, 390.
Empoasca, 212, 213. albopicta, 213. aurea-viridis, 213. consobrina, 213. fabae, 213. malefica, 213. maligna, 213. obtusa, 213. pura, 213. viridescens, 213.
Empretia stimulea, 142.
Emus olens, 5.
Enchenopa binotata, 389.
Eniconyx, 92.
Enodia portlandia, 274.
Entheus vitreus, 33.
Entomological club A. A. A. S., 95, 363.
Entomological collections, 72, 115, 116, 118.
Entomological society of London, 56, 300.
Entomologist for Minnesota, 200.
Entomologists of agricultural experiment stations, 156, 200.
Entomology for beginners, 59, 151.
Entomology in geography and literature, 23.
Entomophthoreae, 9.
Entophyta, 15, 45.
Entozoical fungi, 15.
Envo, 397.
Epargyreus tityrus, 277.
Epeira caudata, 114, 147. diadema, 5, 57. insularis, 114. placida, 114. thaddeus, 114. trianea, 71. sp., 9, 283.
Ephemera cupida, 168.
Ephemera, duration of life, 168.
Ephemeridae, 95.
Ephydridae, 403.
Epicalia acontius, 33, 58.
Epicauta callosa, 225. maculata, 224.
Epidemia epixanthe, 276.
Epidemics, insects as authors of, 24.
Epipaschiae, 142.
Epipedesis opifex, 333.
Epipharyngeal organs of taste, 193, 222.
Epipharynx, 193, 222. organs of taste in, 159.
Epitheca obsoleta, 369. 371. yamaskanensis, 367, 371, 405.
Epitola benitensis, 425. cercenoides, 424. goodii, 424. marginata, 425. purpurascens, 425. subfulvida, 423. umbratilis, 425.
Epuraea aestiva, 232.
Erax, 255.
Erebia eurvale-adyte, 92.
Erebus odora, 283.
Eriogaster lanestris, 60.
Eriosoma tessellata, 18.
Erora laeta, 276.
Erycus puncticollis, 150.
Erynnis attalus, 278. manitoba, 278. metea, 278. sassacus, 278.
Erythria, 212, 213. areolata, 212.
Erythroneura, 211, 212, 213. affinis, 390. tricincta, 390. vitifex, 390. vulnerata, 390.
Esthesopus, 92
Etoblattina, 289.
Eucanthus orbitalis, 388.
Euchaetes egle, 421.
Euchloe cardamines, 363.
Eucrostis indigenata, 151.
Eudamus proteus, 277. tityrus, 421.
Eugonia j-album, 275.
Euleucophaeus, 327.
Euliphyra, 423. mirifica, 423.
Eulvonetia, 21.
Eumaeidi, 143.
Eumecosoma, 257.
Eumolpidae, 22.
Eupelmidae, 117.
Euphoberia, 293.
Euphoeades troilus, 277.
Euphoria sepulchralis, 233.
Euphydryas phaeton, 275.
Euphyes metacomet, 278. verna, 278.
Euploeinae, 55, 405.
Eupteryx, 75, 211, 213, 214. germari, 76. pictae, 211. pulchella, 76. urticae, 76, 212. vittata, 76, 212.
Euptoieta claudia, 275.
Eurema lisa, 276.
Eurygaster alternatus, 241. maurus, 241.
Eurymi, 192.
Eurymus, 192. eurytheme, 277. interior, 276. philodice, 192, 276.
Euryomia inda, 228.
Euryptera lateralis, 225.
Eurytoma punctiventris, 187, 221. sp., 186, 187, 221.
Euscirrhopterus gloveri, 94.
Eutermes rippertii, 113, 203, 204, 205, 207, 208, 222.
Euvanessa antiopa, 275, 330, 331.
Euzophera cinerosella, 296. implectella, 298. semifuneralis, 295. zellerella, 296.
Evaniidae, 159.
Everes comyntas, 276.
Exema gibber, 234.
Experiment station entomologists, 156, 200.
Extra-nuptial nectar-glands, 171.

Feigning death, 141.
Feniseca tarquinius, 70, 92, 276.
Fernald, Prof. C. H. 300. Prof. H. T. 379.
Fidonia atomaria, 170.
Fitch, Asa, 138.
Fitch's homoptera, 387.
Flacherie, 11, 12, 19, 20, 110.
Flata bivittata, 389. bullata, 389. conica, 389. humilis, 389. nava, 389. opaca, 389. pallida, 389. pruinosa, 389. quinquelineata, 389. stigmata, 389.
Flies migrate, do, 402.
Flies as propagators of disease, 116.
Fontaria gracilis, 442. virginiensis, 442.
Food plants of American butterflies, 274.
Fossil insect localities in the Rocky Mt. region, 363.
Fossil insects, work of a decade, 1880–1889, 287.
Fossil lepidoptera, 70.
Forficula auricularia, 20, 93. sp., 117, 195, 196.
Forficulidae, 24.

Formica integra, 284. niger, 58. pennsylvanica, 175. ruber, 58.
Formicidae, 9, 21, 141, 154.
Foul brood, 19.
Fruit tree insects, 115, 116.
Fulgora sulcipes, 389.
Fulgoridae, 321.
Fungi parasitic on insects, 24.
Fungoid growths on insects, 15, 16, 17, 18, 19, 20, 45, 46, 110, 118.

Galerita lecontei, 231.
Galeruca integra, 234.
Galgulidae, 292.
Galleriidae, 143.
Gammarotettix, 140.
Gastropacha, 327. rubi, 8, 9.
Gastrophilus, 403. equi, 403.
Gelechia, 21, 32. gallaesolidaginis, 51.
Geography, entomology in, 23.
Geometridae, 151.
Geophilidae, 170.
Geotrupes, 103, 105, 109. balyi, 104, 107, 108, 109. blackburnii, 106. 107, 110. chalybaeus, 104, 105, 109, 110. chevrolati, 110. conicollis, 110. egeriei, 106, 110. excrementi, 110. haldemani, 110. hornii, 107, 109, 110. jekellii, 110. lecontei, 110. melsheimeri, 110. miarophagus, 109. mixtus, 109. occidentalis, 104, 106, 109, 110. opacus, 106, 110, 233. retusus, 106, 109. semiopacus, 106, 110. splendidus, 106, 109. starkii, 104. ulkei, 106, 110.
Geralinura, 288.
Gibbium scotias, 32.
Glaphyrosoma, 140.
Glossina morsitans, 95.
Glover's Illustrations, 43.
Glyphypteryx, 32.
Glypta simplicipes, 52. vulgaris, 52.
Glyptoscelis pubescens, 234.
Gnathodus, 75, 76, 211. punctatus, 76.
Goes pulchra, 233. pulverulenta, 233.
Goldenbergia, 118.
Gonastista grisea, 380.
Gonia exul, 43, 284. frontosa, 43, senilis, 43.
Gorytes sp., 141.
Gracilaria, 32.
Grapta interrogationis, 59, 133.
Grasshopper village, 118.
Greenland insects, 405.
Gryllacrididae, 140.
Gryllacris, 140.
Gryllidae, 271.
Gryllotalpa americana, 45. columbia, 135. sp., 15.
Gryllus, 272. campestris, 5. hirtipes, 434. sp., 199.
Grypotes tergatus, 390. unicolor, 390.
Gundlach's entomologia cubana, 364.
Gymnes, 432, 434, 440. punctatus, 440.
Gymnopternus, 375, 376. barbatulus, 356. poeniteus, 355, 356. scotias, 356. tristis, 356.
Gypona flavilineata, 388. octolineata, 390. scarlatina, 388.
Gyrinus natator, 119. sp., 284.

Hadena, 405. juncimacula, 58. solieri, 150.
Hadenoecus, 198, 199. subterraneus, 198.
Haematobia serrata, 343.
Hagen, Dr. H. A., 300.
Halias prasinana, 60.
Halisidota caryae, 422. harrisii, 421. tesselaris, 422.
Haltica chalybea, 234. ignita, 234. inaerata, 234.
Haploglossa, sp., 232.
Haplophlebium, 118.
Harpalus faunus, 227.
Harris's homoptera, 387.
Hearing 140.
Hebrus pusillus, 240.
Heliconia charithonia, 23.
Helicoptera opaca, 389. pallida, 389.
Heligmoneura, 255.
Heliothis sp., 173.
Heliria scalaris, 390.
Helluomorpha bicolor, 231.
Helochara communis, 388.
Helophorus lacustris, 232.
Hemileuca maia, 326, 327.
Hemileucini, 325.
Hemiptera, deformed, 34. mimicry in, 27.
Henops marginatus, 404.
Heodes hypophlaeas, 276.
Heraclides, 277.
Hesperia centaureae, 278. montivaga, 278. syrichtus, 33.
Hesperidae, 33, 139.
Hesperidi, 139.
Hessian fly parasite, 39.
Heterocampa astarte, 53. subalbicans, 53. subrotata, 421. unicolor, 421.
Heterocera, early stages of some, 259. list of, 141.
Heterophlebia, 293.
Heteroptera, 116.
Hexapoda, anatomy, 21.
Hibernating butterfly, diary of a, 330.
Hilara, 99.
Hilarimorpha, 99, 100. mikii, 100. singularis, 100. tristis, 100.
Hill, W. W., 143.
Hippacris, 432, 434, 441. crassa, 441. picticornis, 441.
Hipparchia ridingsii, 284.
Hippodamia convergens, 56, 70, 232, 279. glacialis, 232.
Hister vernus, 282.
Holcaspis bassetti, 187, 215, 216, 221. duricoria, 187, 216, 221. globulus, 187, 221. mamma, 187. rugosa, 187, 221.
Homalium humerosum, 232.
Homalojisca coagulata, 389.
Homalota elevata, 232. festinans, 232. plana, 232.
Homoptera of Say, Harris and Fitch, 387.
Honey ants, 32, 58.
Horistonotus, 92.
Horn, G. H., 71.
Horn-fly, 343.
House-fly, fungus upon, 15, 19.
Household pests, 59, 170.
Hybernia tiliaria, 142.
Hydrobius tessellatus, 232.
Hydrocyanic acid secreted by Polydesmus virginiensis, 442.
Hydrophilus triangularis, 22, 150.
Hydrophorus innotatus, 378. philombrius, 378.
Hygroceleuthus, 337.
Hylephila phylaeus, 278.
Hylurgini, 56.
Hymenoptera, collecting, 143. rearing, 143.
Hypatus bachmanii, 276.
Hyperchiria io, 117, 325, 326, 327, 421.
Hyperplatys aspersus, 233.
Hyphantria cunea, 421. textor, 6.
Hypocharassus, 337.
Hyponomeutia, 21.
Hyptiotes cavatus, 72.

Icerya purchasi, 90, 119.
Ichneumon rufiventris, 53.
Ichneumonidae, 9. biological notes, 51.
Ichthyura inclusa, 262.
Idia, 212, 213. pullula, 212. scutellaris, 212.
Idiocerus alternatus, 388, 389. lachrymalis, 388. maculipennis, 388. pallidus, 388, 389. ramentosus, 389. suturalis, 388.
Ilythea spilota, 403.
Incisalia augustus, 137, 276. irus, 137, 276. niphon, 137, 276.
Insect diseases, bibliography of, 15, 45. contagious, 3. protozoan, 4.
Insect life, 90.
Insect world, 24.
Insects as authors of epidemics, 24.

Insects, fungi parasitic on, 15, 20, 24. habits of, 118. migrations of, 24. molts of, 28.
Instinct, 117.
Iphiclides, 191. ajax, 277.
Ireland, neuroptera of, 379.
Iridomyrmex, sp. 176.
Iris, 119.
Ischiodontus, 92.
Ischyrosyrphus, 20.
Ixodidae, 46.

Japan, lepidoptera of, 142.
Jasoniades glaucus, 191, 277.
Jassidae, 75, 238, 240.
Jassini, 75.
Jassus, 75. acutus, 389. clitellarius, 389. fulvidorsum, 390. immistus, 389. inimicus, 389. irroratus, 389. novellus, 389. olitorius, 389. sanctus, 387. seminudus, 389. subbifascitus, 389. verticis, 389.
Julodis finchi, 56.
Julus, 293. moreleti, 317. sp., 15, 45.
Junonia coenia, 275, 379.

Killing coleoptera, 140.
Koebele, Albert, 119.
Kolbe's guide, 405.
Kreischeria, 288.
Kybos, 75, 76, 212. commisuralis, 212. smaragdulus, 76, 212, 241.

Labrador, terrestrial arthropods of, 143.
Lac insects, 168.
Lachnocnema exiguus, 427.
Lachnosterna, 93. fusca, 8, 266. prunina, 233. sp., 9.
Lachnus salicicola, 209.
Laemobothrium, 34.
Laemophlaeus modestus, 232. punctatus, 232. pusillus, 232.
Laertias philenor, 277.
Lamenia vulgaris, 390.
Lan prima, 32.
Lamprozona, 257.
Lampyridae, 170.
Lampyris, 169. noctiluca, 170.
Languria bicolor, 232.
Lantana, fertilization of, 33.
Laparus, 255.
Larinopoda campimus, 427. libyssa, 427. perfragilis, 427.
Lasius alienus, 273.
Lathridiidae, 20.
Lathrobium anale, 232.
Latrodectes mactans, 72.
Laverna, 21, 32.
Le Baron's reports, 95.
Lecanium hesperidum, 155. oleae, 115. sp., 20.
Leconte, Dr. J. L., 300.
Lema collaris, 234.

Lepidoptera, consanguinity in, 150. eggs of, 22. food-plants of European, 34. fossil, 70. melanism in, 96. palaearctic, 332. rearing, 137.
Lepidopterous larvae, number of molts of, 420. sexes of, 59. similar characters and similar food-plants in, 33.
Lepisma sp., 195, 196.
Leptalis, 57.
Lepthemis vesiculosa, 307.
Leptidae, 99.
Leptinotarsa decemlineata, 142.
Leptopelma cavicola, 333.
Leptophlebia cupida, 168.
Leptopterna dolobrata, 240.
Leptoschema, 92.
Leptoternis, 435.
Leptura canadensis, 225, 233. exigua, 233.
Lepyronia quadrangularis, 388. saratogensis, 390.
Lerema accius, 278. hiana, 278.
Lestophornus iceryae, 90.
Leucania, 144. unipuncta, 141.
Leucochitonea arsalte, 33.
Liancalus, 337.
Libellula axillena, 385. incesta, 384. lydia, 384, 385. obsoleta, 369. polysticta, 369. pulchella, 384. rubicundula, 385. vacua, 248, 371, 373.
Libellulina, Notes and descriptions, 383.
Liburnia arvensis, 390. dorsalis, 28.
Limacodes scapha, 54.
Limenitis disippus, egg-laying, 14, 30, 43.
Limnochares, 292.
Limnotettix, 75, 76.
Limochores bimacula, 278. manataaqua, 278. pontiac, 278. taumas, 278.
Limonius aurifer, 58.
Linyphia communis, 72, 114. marginata, 71, 114.
Liotheidae, 34.
Liparis chrysorrhoea, 6. monacha, 58. sp., 9.
Lipeurus, 34.
Liphyra, 423. leucyania, 423.
Liponeura yosemite, 34, 117.
Lipoptena dubia, 46.
Listronotus squamiger, 234.
Literature, entomology in, 23.
Lithobius lapidicola, 317.
Lithocolletis, 21.
Litoneura, 118.
Lixus terminalis, 234.
Lochites, 256.
Lochmaeus manteo, 53.
Locomotion on vertical surfaces, 32.

Locusta viridissima, 46.
Locustidae, 46, 195, 271.
Locustodea, 442.
London, entomological society, 56, 300.
Lowne's anatomy of the blowfly, 442.
Lucanus dama, 224, 226.
Lucidota punctata, 226.
Ludius, 92.
Lugger, Otto, 200.
Luminous eggs of insects, 169.
Luminous insects, 94.
Lycaena americana, 42. icarus, 91. pseudargiolus, 43.
Lycaenid caterpillar, feeding habit of, 13.
Lycaenidae, 143. new west African, 423.
Lycosa atlantica, 317. fatifera, 154. kochii, 283.
Lyctus striatus, 233.
Lina lapponica, 234.
Lygaeidae, 27.
Lygaeus leucopterus, 16.
Lygus pratensis, 240.
Lynchia, 255, 259.
Lytta vesicatoria, 115.

Machaerocera, 433, 439.
Machilis variabilis, 196.
McNeill, Prof. Jerome, 405.
Macronychus, 364. glabratus, 232.
Macrosila cingulata, 58.
Mails, bees in the, 95.
Male element the originating factor in the development of species, 269.
Mallophaga, 34.
Mallophora, 255.
Mamestra picta, 20. promulsa, 58.
Mancipium brassicae, 192.
Mantidae, 270, 380.
Mantis wheeleri, 380.
Mantispa brunnea, 224.
Maynard's butterflies, 379. contributions to science, 200.
Mecaptera, 159.
Mecicobothrioidae, 22.
Mecicobothrium thorellii, 22.
Mecistocephalus guildingii, 317.
Meconium of butterflies, 170.
Mecynotarsus, 93.
Megalodacne fasciata, 317.
Megapoda, 256. labiata, 256.
Megilla maculata, 188, 279.
Melampsalta, 67. pallescens, 68. parvula, 68.
Melanism, 91, 155. in lepidoptera, 96.
Melanophthalma distinguenda, 20.
Melanoplus, 270, 271, 272.
Melanostoma, 20.

Melanotrupes, 105. 107, 110.
Melanotus macer, 233. paganus, 233.
Melanoxanthus salicti, 208.
Melia, 299.
Meliraea harrisii, 153. minuta, 120. phaeton, 54.
Melittia cucurbitae, 56.
Melolontha vulgaris, 193. sp., 6, 15, 16, 45.
Melolonthidae, 9.
Melon louse, 411.
Membracis ampelopsidis, 391. arquata, 389, 391. belligera, 389. bimaculata, 391. binotata, 389. calva, 389. diceros, 389. festina, 389. goniphora, 389. inornata, 389, 391. latipes, 389. marmorata, 389. mera, 389, 391. quadrivittata, 389. semicrema, 389. subulata, 387. tartarea, 389. trilineata, 389. univittata, 391. vau, 389.
Memory, 155.
Menopon, 34.
Merisus destructor, 141. subapterus, 118.
Mesograpta, 20.
Messa salicum, 284.
Metal-cutting beetle, 119.
Meteorological conditions upon insect-life, effect of, 155.
Metopeuron, 34.
Metopsilus elpenor, 140.
Michigan, coleoptera of the ower peninsula of, 231.
Microcentrus caryae, 391.
Microdon sp., 284.
Microglossa suturalis, 232.
Micropteryx caltella, 161. semipurpurella, 161, 194.
Micropus leucopterus, 16.
Midaidae, 100, 101, 102.
Migration of birds and food supply, 118.
Migration of insects, 24, 116.
Milnesium sp., 22.
Mimetic coloration of pupae of butterflies, 48.
Mimicry, 56, 141. in hemiptera, 27.
Minnesota, entomologist for, 200.
Mitura daemon, 137, 276. smilacis, 137.
Mole, insectivorous habits of, 116.
Mole cricket, 15.
Molts of insects, 28.
Molts of lepidopterous larvae, number of, 420.
Monecphora bicincta, 388, 390. ignipecta, 390.
Monohammus titillator, 56, 233.
Moore's lepidoptera Indica, 405.
Mordella octopunctata, 234.
Mormolucoides, 291.
Mosquito, poison apparatus of, 119.
Mosquitoes, scourge of, 47.
Mubiona gracilis, 114.
Musca domestica, 346. vomitoria, 155.
Muscardine, 7, 16, 46.
Muscles of insects, 21.
Mutilla coccinea, 135.
Mutillidae, 34, 147.
Myas coracinus, 231.
Mycetochares bicolor, 234.
Mycetophilidae, 117.
Mycotrupes, 105, 106, 109.
Mygale hentzii, 55. nidulans, 148. sp., 9, 55.
Mygalidae, 333.
Myiothera, 259.
Mylacridae, 290.
Mylacris 290.
Myndus impunctatus, 390.
Myriopods, army of, 95. phosphorescence of, 170.
Myrmecocystus melliger, 32.
Myrmecophilism, 171.
Myrmecophilous coleoptera, 154. insects, 21. plants, 176.
Myrmekiaphila foliata, 89.
Myrmeleon diversum, 224.
Myrmophilous coleoptera, 141.
Myscelia orsis, 33.
Mytilaspis, sp., 46.
Myxosargus fasciatus, 31.
Myzus cerasi, 412, 413, 414. ribis, 210.

Naso robertsoni, 388.
Nathalis iole, 115, 154.
Nebria obliqua, 69. ovipennis, 69. purpurata, 69, 282. trifaria, 69, 282.
Necrology, 35, 156.
Necrophilus subterraneus, 58.
Necrophorus guttula, 232.
Nectar-glands, extra nuptial, 171.
Nectar-secreting plant-lice, 47.
Nematus erichsonii, 162.
Nemesia sp., 88.
Nemistrinidae, 100, 101.
Nemognatha lurida, 225. piezata, 234.
Nemoria aureliaria, 151.
Neolaparus, 255.
Neomoctherus, 255.
Neonympha canthus, 348. phocion, 274.
Neophoneus, 255.
Neortus, 140.
Neottiglossa inflexa, 241. undata, 241.
Nephelodes violans, 12, 18.
Nephopteryx semifuneralis, 298.
Nepticula, 21.
Nervous system of arthropods, 32.
Neurocordulia obsoleta, 369.
Neuroptera of Ireland, 379.
Neuroptera, preserving, 93.
Neuroterus nigrum, 218, 221. noxius, 187, 221. vesicula, 188, 221.
New Jersey butterflies, 155.
Nisoniades alpheus, 228.
Noctuidae, 6, 9, 143.
Noda convexa, 22. pilula, 22. tristis, 22.
Nomenclature, 142.
Nomiades couperi, 276.
Non-development of wing, 120.
Notacantha, 31, 34.
Nothrus, 293.
Notodonta unicornis, 53. sp., 81.
Notodontidae, 53.
Notoxus, 93. monodon, 234.
Notus, 212, 213. flavipennis, 212. furcipatus, 212. orichalceus, 212.
Nusa, 255.
Nycteribia elongata, 46. varipes, 46.
Nymphalidae, 35.

Ocneria dispar, 120.
Ocyptamus, 20.
Odonata, 292. of North America, 241, 303.
Odorific apparatus of lepidoptera, 93.
Odorous butterflies, 35.
Odors, action of, 22.
Oecanthus, 271. angustipennis, 271. fasciatus, 271. niveus, 199, 271. pellucens, 379.
Oedancala dorsalis, 27.
Oedemasia concinna, 421.
Oedionychis scalaris, 234.
Oedipoda carolina, 135. sp., 10.
Oedipodae, 270.
Oedipodidae, 431, 432, 434. rescued from tryxalidae, 431.
Oedipodinae, 435.
Oelrichs, Hermann, 200.
Oeneis jutta, 274. semidea, 274.
Oestridae, 403.
Oliarus humilis, 389. pruinosa, 389.
Oligonyx graminis, 380. scudderi, 380. uhleri, 380.
Oligoria maculata, 278.
Oncideres cingulatus, 142.
Oncometopia limbata, 389.
Onychotrupes, 104, 105, 106 109.
Ophiderma, 389, 391.
Opostega, 32.
Opsiocoetus personatus, 240.
Optilete, 391.

Orchelimum, 271, 272,
Orgyia antiqua, 29, 120. definita, 421. inornata, 300. leucostigma, 29, 51, 52, 300.
Ormenis pruinosa, 389.
Ormyrus minutus, 188, 221. ventricosus, 187, 221. sp., 221.
Ornithobius, 34.
Orthezia sp., 284.
Orthophlebia, 291.
Orthoptera, British, 379. families of, 141.
Orya barbarica, 170.
Oscinidae, 90.
Osmoderma eremicola, 238. scabra, 281.
Osprioceras, 102.
Otiocerus amyoti, 388. kirbyi, 388. signoreti, 388.
Otiorhynchus apiculatus, 333. ovatus, 234. sulcatus injurious to plants, 343.
Oxypoda minuta, 232.

Packard, Dr. A. S., 47, 95, 300.
Packard's entomology for beginners, 59, 151.
Pachybrachys carbonarius, 234. luridus, 234. othonus, 234.
Pactopus hornii, 93.
Palaearctic lepidoptera, 332.
Palaeoblattariae, 290.
Palaeoblattina, 288.
Palaeocampa, 288.
Palaeophlebia, 293.
Palingenia, 289.
Paltostoma torrentium, 33, 57.
Pamphila mandan, 278. uncas, 284.
Pamphilidi, 139.
Panchlora nivea, 405.
Panopoda roseicosta, 259. rufimargo, 259.
Panorpa 159, 162, 164. debilis, 160, 161, 163.
Panorpidae, 161, 194.
Pantherodes pardalia, 57.
Paolia, 118.
Paonias astylus, 265. myops, 266.
Paphia troglodyta, 228.
Papilio, 191. ajax, 52. aristolochiae, 35. asterias, 52, 305. chalcas, 138. cresphontes, 282, 421. dasarada, 35. godeffroyi, 48. machaon, 46. marcellus, 52, 135. philenor, 138. polyxenes, 277. rutulus, 228. schmeltzi, 48. troilus, 52. turnus, 52, 135. sp., 9, 18.
Papilionidae, 35.
Parademus gracilis, 442.
Paraponyx oryzalis, 155.
Parasitic fungi, 118.
Parasitic tineids, 47.
Parasitism, 3, 15, 16, 45.
Paria aterrima, 234. sexnotata, 234.
Parlatoria sp., 46.
Parnassius, 328.
Parnidae, 364.
Pasimachus elongatus, 231.
Passalus sp., 15, 45.
Patten, Dr. William, 405.
Peach aphis, 412.
Pébrine, 4, 6, 7, 16, 20.
Pedigree moths, 94.
Pediopsis occidentalis, 238. trimaculata, 388. virescens, 238. viridis, 238, 388.
Pedioscirtetes, 433, 438. maculipennis, 437. nevadensis, 438. pulchella, 437.
Pedipalpi, 289.
Pelastoneurus, 376.
Pelecinus polycerator, 13.
Pelopoeus caeruleus, 135.
Peloropeodes, 337, 373. salax, 337, 374.
Peltotrupes, 105, 109, 110.
Penthimia americana, 388.
Pentila evanescens, 429.
Perilitus americanus, 279.
Periplaneta orientalis, 22, 34.
Perla sp., 222.
Peruvia, 432, 433, 439. nigromarginata, 439.
Petrablattina subtilis, 289.
Pezotettix, 270, 271, 272. viridulus, 270. sp., 10.
Phalangidae, 282.
Phalangium sp., 9.
Phanaeus carnifex, 135, 233.
Phaneroptera falcata, 379.
Phasmidae, 270, 290.
Pheosia rimosa, 261.
Philaenus lineatus, 388. spumarius, 240.
Philampelus, 397.
Philonthi, 93.
Philonthus, 93. longicornis, 232. microphthalmus, 252. sordidus, 232. umbrinus, 232. varians, 232.
Phlepsius fulvidorsum, 390. irroratus, 389. strobi, 390.
Phloeothrips armata, 23. frumentaria, 23.
Pholisora catullus, 278.
Phoneus, 255.
Phorodon humuli, 125.
Phosphorescence of myriopods, 170.
Photopsis alcanor, 284. glabrella, 284.
Phryganeidae, 141.
Pathanocoris, 289.
Phycanassa viator, 278.
Phyciodes batesii, 275, 282. tharos, 275.
Phycitidae, 142, 143.
Phydippus tripunctatus, 72.
Phylloecus integer, 90.
Phyllophaga sp., 17.
Phyllotreta albionica, 284. pusilla, 228, 284.
Phylloxera vastatrix, 141. vitifoliae, 141.
Phymatidae, 432.
Phymatodes amoenus, 233. dimidiatus, 233.
Phypia nava, 389.
Phytala elais, 425.
Phytonomus punctatus, 10, 46.
Phytophthires, 22.
Pierinae, 69.
Pieris, 191. brassicae, 10, 59, 93, 94. napi, 46, 166. oleracea, 166, 277. rapae, 6, 10, 12, 18, 19, 20, 30, 50, 91, 117, 143, 167, 191, 192, 277, 283. curious pupa of, 30. parasites stinging pupae of, 30. sp., 9.
Pimpla, 405. alboricta, 52. annulipes, 51. conquisitor, 51. inquisitor, 52. notanda, 51. sp., 13.
Pinipestis reniculella, 142.
Pioneer painter of N. A. insects, 134.
Pityophthorus pullus, 235.
Plagiodera scripta, 173.
Plagionotus speciosus, 233.
Planocephalus, 292.
Plant lice, nectar secreting, 47.
Plateros canaliculatus, 233.
Platycheirus, 20.
Platycotis belligera, 389. quadrivittata, 389.
Platygaster herrickii, 39, 40. hiemalis, 39, 40. minutus, 40.
Platymetopius acutus, 389.
Platypedia, 67. areolata, 68. putnami, 68.
Platypsylla castoris, 71.
Platypsyllidae, 21.
Platypsyllus castoris, 21.
Platysamia cecropia, 29, 118, 421.
Pleocoma, 142.
Pleurophorus, 92.
Plum borer, 295.
Plusia, 405. rimosella, 9. sp., 19, 46.
Pluteloptera, 21.
Poanes massasoit, 278.
Poecilopteра vulgaris, 390.
Poey, Felipe, 363.
Poison apparatus of mosquito, 119.
Poisons on Gyrinus, effect of, 119.
Polioptenus, 118.
Polistes sp., 30, 48.
Polites peckius, 278.
Polycaon confertus, 116.
Polydesmus erythropygus, 96. virginiensis, 442.

Polydrosus sericeus, 94.
Polygonia comma, 275. faunus, 275. gracilis, 275. interrogationis, 275. progne, 275. satyrus, 275. wintering, 330.
Polymedon, 337.
Polymoechus brevipes, 150.
Polyommatus phlaeas, 46.
Pontia, 191. protodice, 277.
Porphyrops, 337. longipes, 361.
Preparation, microscopic, 141.
Preserving coleoptera, 140. insects, 92. larvae, 94. lepidoptera, 93. neuroptera, 93.
Proarna, 67. championi, 68.
Proctotrupidae, 159.
Protective coloration, 93. resemblances, 141, 154. in spiders, 147.
Protozoan diseases of insects, 4.
Psalistops melanopygia, 333.
Psammodius, 92.
Pseudarchilestes, 259.
Pseudatrichia, 31.
Pseuderesia catalina, 425. despecta, 426. helena, 426. latruncularia, 426. o-rubrum, 425.
Pseudidiops opifex, 333.
Pseudohazis eglanterina, 325, 326, 327.
Pseudoleon, 384.
Pseudorus, 256. bicolor, 256. piceus, 256.
Pseudovates chlorophaea, 380.
Psilopus, 376.
Psoa maculata, 93. quadrisignata, 93.
Psocidae, 116, 292, 293.
Psocus novae-scotiae, 222. sp., 222.
Psysopoda, 292.
Pteromalidae, 116.
Pteromalus puparum, 30.
Pteronarcys sp., 222.
Pterycodes, 93.
Publidia concava, 389.
Pulex penetrans, 135.
Pupipara, 46.
Pyractomena borealis, 284.
Pyralidae, 44, 155.
Pyrameis cardui, 6, 12, 53, 284. sp., 93.
Pyrrharctia isabella, 52, 422.

Quadrina, 327.
Queen ant, 93.

Ratzburgia amphicerovora, 117.
Rearing hymenoptera, 143.
Relaxing, 91.
Reproduction of lost limbs in coleoptera, 138.
Rhagium lineatum, 233.
Rhaphiomidas, 102.
Rhaphium, 337.
Rhathimomyia, 257.
Rhingia rostrata, 57.
Rhipidorhabdi, 291.
Rhipiphorus paradoxus, 92. pectinatus, 234.
Rhizophagus bipunctatus, 232.
Rhodites, bicolor, 284. rosaefolii, 284.
Rhodoceridi, 192.
Rhopalocera, 22, 142.
Rhynchophora, 9, 119.
Rhysodidae, 165.
Rhytidicolus structor, 333.
Riley, Dr. C. V., 300.
Riverside natural history, 96.
Rocky Mt. region, fossil insect localities in the, 363.
Romaleum atomarium, 233.
Ross's narrative, 141.
Rovartani lapok, 23.
Rubber stoppers, 91, 92.
Rusticus scudderii, 13, 276.

Sadala, 143.
St. John's larva collecting, 363.
Samia cynthia, 89, 135. gloveri, 118.
Sannina exitiosa, 141, 295.
Saperda candida, 233. sp., 9.
Sarcophaga, 403.
Saturnia carpini, 60. io, 318.
Satyrodes canthus, 406. eurydice, 274.
Say's homoptera, 387.
Scales, 155.
Scaphoideus immistus, 389.
Scaphura sp., 70.
Scellus, 337.
Scenopinidae, 31.
Scenopinus, 31.
Scepsis edwardsii, 421.
Schizomycosis, 11.
Schizoneura corni, 129. cornicola, 124, 129. lanigera, 22, 116.
Schizura ipomeae, 53, 421. leptinoides, 421.
Schoenobates, 140.
Sciaphilus muricatus, 137.
Scirtes orbiculatus, 233.
Scolia sp., 141.
Scolopendra forficata, 93. subspinipes, 317.
Scolopostethus affinis, 240.
Scolops sulcipes, 389.
Scolytidae, 56.
Scolytus rugulosus, 295.
Scourge of mosquitoes, 47.
Scriptotricha culta, 228.
Scudder's butterflies, 120, 363.
Scutigera coleoptrata, 116.
Seirarctia echo, 351.
Selenocephalus vitellinus, 390.
Semnopsyche diana, 85.
Senobasis, 255, 256. analis, 255, 256.
Sesia tipuliformis, 91.
Sesiidae, 91.
Setting, 92, 94, 115, 142.
Sexes of lepidopterous larvae, 59, 155.
Sialis infumata, 223.
Signoret, Dr. V., 300.
Silpha peltata, 135.
Silusa, sp., 232.
Simulium reptans, 44.
Siphonophora ambrosiae, 127. avenae, 411, 414. frigidae, 127. pelargonii, 139. rudbeckiae, 127.
Smell, 140.
Smerinthi, 283.
Smerinthus astarte, 284. excaecatus, 152, 153. geminatus, 152. ocellatus, 153. populi, 153. tiliae, 153.
Smilia auriculata, 390. castaneae, 390, 391. querci, 391.
Smith collection of beetles, 200.
Snow, Prof. F. H., 379.
Sound-producing ants, 91, 92, 93.
Spalgis s-signata, 426.
Species, male element the originating factor in the development of, 269. study of, 77.
Spectrum bivittatum, 197.
Sperchon glandulosus, 71.
Spermophagus robiniae, 234.
Speyeria idalia, 275.
Sphaerophoria, 20.
Sphaerularia bombi, 14.
Sphegidae, 9, 70.
Sphex cementaria, 135.
Sphinges, 15.
Sphingidae, 9, 137, 143, 152. early stages of two, 396. of North America, 59.
Sphinx drupiferarum, 137. gordius, 228, ligustri, 140. luscitiosa, 85. pinastri, 154.
Spider bites, fatal, 72.
Spider, foot of, 155. poisons of, 200. thread of, 154. wasp and, 58.
Spiders attacking bees, 118.
Spiders, dipterous parasite of, 404. engineering, 118. mental powers of, 47. protective resemblances in 147. trap door, 47. trap door nests of, 88, 333. Walckenaer's names of American, 113.
Spilosoma congrua, 263. lubricipeda, 142. virginica, 280. zatima, 142, 151.
Spirobolus heilprini, 317.
Stable-fly, 95.
Stagomantis carolina, 380. dimidiata, 380.
Staphylinidae, 9, 56, 91.
Staphylinus violaceus, 227.
Staten Isl., water beetles of, 142.

Stauronotus, 434.
Stenini, 91.
Stenobothrus, 434. melanopleurus, 272.
Stenocranus dorsalis, 390.
Stenopelmatidae, 140.
Stenopelmatus, 140.
Stenoptycha pallulella, 299.
Stenus, 91. arculus, 232.
Stichophthalma camadeva, 35.
Stictocephala festina, 389. goniphora, 389. inermis, 389.
Stizus sp., 141.
Stomoxys calcitrans, 95, 343, 344, 345, 346.
Stothis astuta, 333.
Strangalia bicolor, 233. famelica, 233. luteicornis, 233.
Strawberry root louse, 273.
Strebla longipes, 46.
Strongylium crenatum, 58.
Strophosomus coryli, 137.
Strymon titus, 137, 276.
Sugaring, 91, 92.
Swarm of insects, 143.
Swarming of aphides, 23.
Sylphis, 242.
Sympycnus, 376.
Synarthrus cinereiventris, 362.
Synemosyna formica, 147.
Synergus ficus, 187. lignicola, 185, 186, 187, 221. sp., 187, 221.
Syntomaspis sp., 185, 187, 221.
Syntomeida epilais, 421.
Syrbula admirabilis, 272.
Syrphidae, 10, 20, 57, 292.
Syrphus, 20. sp., 16.
Systena hudsonias, 234.

Tabanidae, 409.
Tabanus bovinus, 119.
Tachinidae, 20.
Tachytrechus, 337.
Tanypus nebulosus, 44.
Tarantula, 93.
Tardigrades, 58.
Taste in birds, 91, 155.
Taste, epipharyngeal organs of, 193, 222.
Taste in the epipharynx, organs of, 159.
Tegenaria sp., 283.
Tegeticula yuccasella, 32.
Telamona ampelopsidis, 391. cissi, 391. concava, 388, 391. coryli, 388, 390, 391. cyrtops, 391. excelsa, 391. fagi, 390. fasciata, 388, 391. mexicana, 391. monticola, 390, 391. ornata, 391. pyramidata, 391. querci, 390, 391. reclivata, 388, 391. tristis, 390, 391. unicolor, 391.
Telea polyphemus, 6, 118.
Telegonus mercatus, 33. midas, 33.
Telephorus marginellus, 233. rotundicollis, 226.
Tenebrio molitor, 6, 9.
Tenebrioides castanea, 232. laticollis, 232.
Tenebrionidae, 9, 406.
Tenthredinidae, 159.
Teras minuta, 52.
Teriomima leucostola, 429. tenera, 429. xanthis, 429. xanthostola, 429.
Termes devastans, 208. flavipes, 139. gilvus, 204, 206, 207, 208. lucifugus, 23, 251, 253.
Termites, 18, 140, 144, 250. injurious to growing trees, 379.
Termitidae, 91, 92.
Termitina, 118, 289, 292.
Termopsis angusticollis, 223.
Territelariae, 22.
Territelarium, 22.
Tetragnatha, 147.
Tetragoneuria, 383.
Tetranychus telarius, 118, 143.
Tetraopes quinquemaculatus, 233.
Tetrastichus sp., 184, 187, 221. productus, 119.
Tetratoma truncorum, 234.
Tettigia, 67. characteria, 68. hieroglyphica, 68, 388. johannis, 68. sexguttata, 68.
Tettigonia, 211. basilaris, 389. bifida, 388. coagulata, 389. comes, 389. fabae, 391. hieroglyphica, 388. limbata, 389. mixta, 390. mollipes, 390. obliqua, 390. occatoria, 390. octolineata, 390. quadrivittata, 390. rosea, 391. trifasciata, 390. tripunctata, 388. versuta, 390. vitis, 391.
Thais rumina, 135.
Thalessa atrata, 135.
Thamnotettix, 75, 76. clitellarius, 389.
Thanaos, 86, 139. ausonius, 88, 278. brizo, 88, 139, 278. horatius, 88, 278. icelus, 88, 139, 278. juvenalis, 87, 278. lucilius, 87, 278. martialis, 88, 278. persius, 88, 278. terentius, 88, 278.
Thecla acadica, 137, 276. calanus, 137, 276. edwardsii, 137, 276. liparops, 137, 276. ontario, 276. strigosa, 282.
Theclidi, hibernation of, 137.
Thelia acuminata, 391. bimaculata, 391. crataegi, 388, 391. porphyrea, 391. turriculata, 391, uhleri, 391. univittata, 391.
Thelyphonus giganteus, 57.
Theraphosidae, 22.
Therevidae, 100, 101.
Theridion sphaerula, 114.
Theridium, 72.
Thesprotia baculina, 380.
Thionea bullata, 389.
Thomisus aleatoreus, 154. celer, 147.
Thorybes bathyllus, 278. pylades, 278.
Thrips, 23, 96. antennata, 23. rufa, 23. secalina, 23.
Throscidae, 93.
Thymele proteus, 33. protillus, 33. simplicius, 33.
Thymelicus aetna, 278. brettus, 278. mystic, 278.
Thyreonotus, 272.
Thyreus, 397. abbotii, 397.
Thysanoptera, 96.
Tiblcen, 67. cassinii, 68. hesperinn, 68. noveboracensis, 68. occidentalis, 68 rimosa, 68, 389. septendecim, 68. striatipes, 68. synodica, 68. 389, tredecim, 68.
Tinea cloacella, 44. granella, 91. sp., 115.
Tineidae, 9, 144, 161.
Tineids, parasitic, 47.
Tineina, 21, 32.
Tiphia inornata, 16.
Tipula, 21. dispellens, 117. pratensis, 5.
Tipulidae, 117.
Titanophasma, 118, 289.
Tomicus calligraphus, 235.
Tomonotus, 434.
Tortricidae, 144.
Tortrix sp., 141.
Torymus sp., 184. 221.
Townsend, C. H. T., 71.
Townsend, Tyler, 119.
Tracheae and veins, 140.
Tracheal gills, 153.
Tragopa dorsalis, 391.
Trap-door nests of spiders, 333.
Trap-door spiders, 47.
Trap-door spider's nest, use of two doors in, 88.
Trichodectes, 34.
Tricholabioides, 34.
Trichoptera, 33.
Trichopterygidae, 93.
Tridactylus apicalis, 271. terminalis, 271.
Trimen's S. African butterflies, 143.
Trinoton, 34.
Triphleps insidiosus, 241. niger, 241.
Trogoderma ornatum, 232.
Trogus exesorius, 52. obsidianator, 52.
Tropidolophus, 436.
Trox aequalis, 169. asper, 169. atrox, 169. capillaris, 169. erinaceus, 169, 233. foveicollis, 169. monachus, 169. punctatus, 169. scaber, 169. scabrosus, 169. sub-

erosus, 283. terrestris, 169, 233. tuberculatus, 169. unistriatus, 169.
Trypeta pomonella, 405. sp., 284.
Tryxalidae, 431, 432, 434, 438. oedipodidae rescued from, 431.
Tsetze-fly, 95.
Typhlocyba, 75, 211. 212, 213. affinis, 213, 390. albicans, 214. australis, 214. basilaris, 213, 389. coccinea, 213, 390. comes, 213, 389. commissuralis, 214. fabae, 391. geometrica, 76. lineatella, 212. obliqua, 213, 390. octonotata, 214. querci, 214, 390. rosae, 76, 214, 391. sexpunctata, 76. tricincta, 213, 390. trifasciata, 213, 390. vitifex, 213, 390. vitis, 213, 391. vulnerata, 213, 390. ziczac, 214.
Typhlocybidae, 387.
Typhlocybini, 75, 76, 211, 214.
Typocerus lugubris, 223. sinuatus, 233.

Udeopsylla, 272.
Uloborus, 114.
Uloma imberbis, 234.
Uranotes melinus, 187, 276.
Uroxiphus caryae, 391.

Valgus canaliculatus, 233. squamiger, 233.
Vanessa, 190. antiopa, 91, 92, 94, 152. atalanta, 275. cardui, 140, 190, 192, 275. huntera, 275. polychloros, 152. prorsa, 170. urticae, 152, 155.
Variation, 155.
Varietal nomenclature, 115.
Venation, 31.
Vespa, habit of, 54, 348. crabro, 92. maculata, 155, 159, 162, 348. vulgaris, 159.
Vespidae, 9, 141. vision in, 279.
Vipio coloradensis, 284.
Vision in vespidae, 279.
Vitality of larva of Dermestes, 119.
Vitality of larvae, 118. of Balaninus, 48.
Volucella, 160. bombylans, 142.

Walckenaer's names of American spiders, 113.
Wasp and cricket, 155.
Wasp hunting spider, 142.
Wasp and spider, 58.
Wasps friendly to birds, 47.
Wasps, killing, 58.
Water pipes, insects destructive to, 364.
Weed, C. M., 59, 405.
Westwood's mantidae, 380.
Weyenbergh's writings, 58.
Wheat louse, 411.
White ant from Bahamas, 111.
White grub, 16, 18, 20, 46.
Wilder's writings, 118.
Wilt, Charles, 93.
Winter upon insects, effect of, 58.

Xanthidia nicippe, 276.
Xanthochlorus helvinus, 377. tenellus, 377.
Xiphidium, 195, 198, 272. brevipennis, 197.
Xyleborus pyri, 295.
Xylopinus aenescens, 234.
Xysticus triguttatus, 169.

Yeast fungus as an insecticide, 17, 18, 19.

Zammara, 67. angulosa, 67. smaragdula, 67.
Zopherus bremii, 406. mexicanus, 119.
Zora, 22.
Zygaena, filipendula, 3.
Zyginia, 212, 213. nivea, 212.

CORRECTIONS.

PAGE	COLUMN	LINE				
16	2	26	for	torrubiu	read	torrubia.
58	2	29	"	epicatia	"	epicalia.
76	1	34	"	utricae	"	urticae.
	2	33	"	utricae	"	urticae.
181	—	10	"	mamlata	"	maculata.
211	2	10	"	Gnathodes	"	Gnathodus.
213	2	41	"	coccinia	"	coccinea.
221	6	18	"	Tetrastychus	"	Tetrastichus.
284	1	11	"	Vibrio	"	Vipio.
	2	15	"	West	"	Wet.
		39	"	Erysinum	"	Erysimum.
292	2	11	"	psysopoda	"	physopoda
364	2	46	"	1	"	10
421	1	11	"	.91 +	"	.9 1+
		38	"	subrotata	"	biundata.
422	1	11	"	tesselaris	"	tessellaris.
	2	41	"	tesselaris	"	tessellaris.

erosus, 233. terrestris, 169, 233. tuberculatus, 169. unistriatus, 169.
Trypeta pomonella, 405. sp., 284.
Tryxalidae, 431, 432, 434, 438. oedipodidae rescued from, 431.
Tsetze-fly, 95.
Typhlocyba, 75, 211, 212, 213. affinis, 213, 390. albicans, 214. australis, 214. basilaris, 213, 389. coccinea, 213, 390. comes, 213, 389. commissuralis, 214. fabae, 391. geometrica, 76. lineatella, 212. obliqua, 213, 390. octonotata, 214. querci, 214, 390. rosae, 76, 214, 391. sexpunctata, 76. tricincta, 213, 390. trifasciata, 213, 390. vitifex, 213, 390. vitis, 213, 391. vulnerata, 213, 390. ziczac, 214.
Typhlocybidae, 387.
Typhlocybini, 75, 76, 211, 214.
Typocerus lugubris, 223. sinuatus, 233.

Udeopsylla, 272.
Uloborus, 114.
Uloma imberbis, 234.
Uranotes melinus, 137, 276.
Uroxiphus caryae, 391.

Valgus canaliculatus, 233. squamiger, 233.
Vanessa, 190. antiopa, 91, 92, 94, 152. atalanta, 275. cardui, 140, 190, 192, 275. huntera, 275. polychloros, 152. prorsa, 170. urticae, 152, 155.
Variation, 155.
Varietal nomenclature, 115.
Venation, 31.
Vespa, habit of, 54, 348. crabro, 92. maculata, 155, 159, 162, 348. vulgaris, 159.
Vespidae, 9, 141. vision in, 279.
Vipio coloradensis, 284.
Vision in vespidae, 279.
Vitality of larva of Dermestes, 119.
Vitality of larvae, 118. of Balaninus, 48.
Volucella, 160. bombylans, 142.

Walckenaer's names of American spiders, 113.
Wasp and cricket, 155.
Wasp hunting spider, 142.
Wasp and spider, 58.
Wasps friendly to birds, 47.
Wasps killing, 58.
Water pipes, insects destructive to, 364.
Weed, C. M., 59, 405.
Westwood's mantidae, 380.
Weyenbergh's writings, 58.
Wheat louse, 411.
White ant from Bahar 111.
White grub, 16, 18, 20, 46.
Wilder's writings, 118.
Wilt, Charles, 93.
Winter upon insects, effect 58.

Xanthidia nicippe, 276.
Xanthochlorus helvinus, 3 tenellus, 377.
Xiphidium, 195, 198, 272. b vipennis, 197.
Xyleborus pyri, 295.
Xylopinus aenescens, 234.
Xysticus triguttatus, 169.

Yeast fungus as an insecticid 17, 18, 19.

Zammara, 67. angulosa, smaragdula, 67.
Zopherus bremii, 406. me canus, 119.
Zora, 22.
Zygaena, filipendula, 3.
Zyginia, 212, 213. nivea, 2

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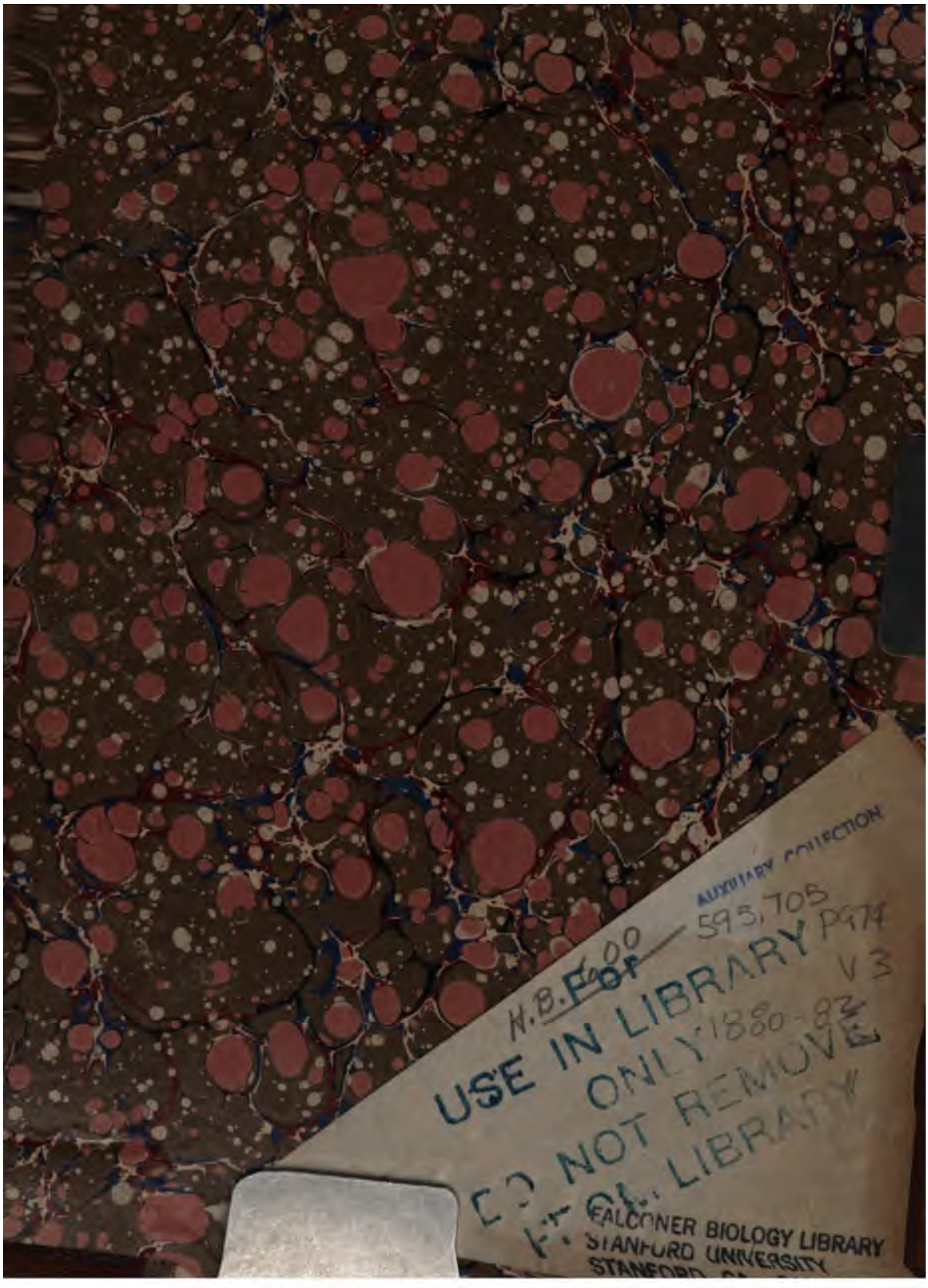
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